

**Title:** Using eye-tracking, head-mounted camera technology and verbal protocol analysis as a methodology to better understand Volume Crime Scene Investigator practice.

This thesis is submitted in partial fulfilment of the requirements for the qualification awarded by Teesside University for the degree of Doctor of Philosophy.

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## **Abstract**

**Literature Review:** Expertise, decision making and situation awareness literature have allowed a better understanding of practitioner performance in Engineering, Healthcare and Sport. Discourse is thin in the domain of Crime Scene Examination, although Hierarchical Tasks Analysis, Distributed Cognition, Team Working and Perception have all received attention in recent years. The use of camera technology to uncover performance has also found footing in diverse professions, notably Firefighting and Social Work. Crime Scene Investigator practice is proposed as being a fertile area of study, to make apparent aspects of the work that are tacit, as well as to ascertain if performance metrics in the sector connect with the tacit knowledge expressed in the role.

**Methodology:** This study explored the differences in searching strategies between expert and novice Crime Scene Examiners (n=12) in a simulated environment, before discussing a longitudinal ethnographic examination of how Volume Crime Scene Investigators (n=4) make sense of their practice. Eye-tracker and head-mounted camera technology was used to capture performance from an own point of view perspective. Nvivo 9 was utilised to collate and code video data, field notes and interview transcriptions.

**Results & Discussion:** Results from verbal protocol analysis and eye-tracker recordings indicate that expert examiners target fewer objects within the crime scene space however spend longer on the objects being viewed. Field study results report that Volume Crime Scene Investigators engage in sharing tacit knowledge, this impacted on their strategies or perception of obtaining forensic evidence. In addition the analysis of coded data from video and verbal protocol reports found that specific physical aspects of examination practice such as fingerprint powdering were aligned to decision making or analysis processes. For example, commenting on the morphology of the surface being examined. Furthermore examiners engaged in and highlighted aspects of their role they felt were important but were not captured in any metrics.

**Conclusion:** It is proposed this new understanding will be of use to those in developing crime scene investigation practitioners as well as presenting related literature on how expertise in the domain can be recognised, elicited and developed in others. This work also sheds light on the value of sector standards for this field along with what is needed to make them more user-friendly for the developing practitioner.

**Keywords:** *Volume Crime Scene Examination; Forensic Science; Head-mounted camera; Eye-tracker; Expertise; Decision making; Tacit knowledge; Shared awareness; Competence, National Occupational Standards*

**Declaration**

I declare that all the work submitted here is the work of the author alone and any collaborations are appropriately noted.

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Mark Butler

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## Table of Contents

Introduction.....	12
Concept and background .....	12
Research questions and thesis overview. ....	13
1 Chapter 1 Literature Review: Exploring Crime Scene Investigation and the use of expertise theories as a basis for exposing and developing practitioner performance.....	17
1.1 Modern historical overview of the Crime Scene Investigator and research in this domain over the last decade. ....	17
1.1.1 Crime Scene Training.....	19
1.2 Volume Crime Scene Investigator and Crime Scene Investigator roles: Exploring skills, culture and theory. ....	21
1.2.1 Knowledge Types and their role for the crime scene practitioner.....	26
1.2.2 Scientific Support: Structure, standards and the focus of research in the last decade in this area.....	31
1.2.3 Document analysis of key performance indicators .....	33
1.3 Assessing top performance in crime scene examination: Project Radisson a case study by Greater Manchester Police.....	38
1.4 What is knowledge and how can it be linked to understanding Crime Scene Investigator practice?.....	41
1.4.1 Is factual evidence the same as ‘truth’ in Crime Scene Investigation?.....	43
1.5 Expertise theory defined and the incremental stages of development: An approach to understanding practitioner performance.....	52
1.5.1 Becoming an expert.....	55
1.6 Eliciting Expertise and performance, moving towards a methodology .....	62
1.6.1 Cognitive Task Analysis: Capturing knowledge and skill.....	63
1.6.2 Head-mounted camera and eye tracking technology in capturing practitioner performance. ....	68
1.6.3 Conclusion.....	70
2 Chapter 2 Methodology: Exploring the use of technology to capture crime scene examination work. ....	73
Introduction .....	73
2.1 Research paradigms: Qualitative vs. Quantitative.....	73
2.1.1 The researcher: acknowledging previous experiences. ....	75

2.1.2	Choosing a paradigm to suit the research questions .....	75
2.2	Observation Methods .....	77
2.2.1	Differences between laboratory and in the field studies.....	77
2.2.2	Opportunities for using naturalistic data .....	79
2.2.3	Applying qualitative tools.....	80
2.3	Study 1: A methodology to compare 'expert' and 'novice' Crime Scene Examiner searching skills using eye-tracker technology.....	83
2.3.1	Participant selection and description of expert Crime Scene Examiners and undergraduate level 4 students studying a Crime and Scene Examination module. 84	
2.3.2	Description of simulated crime scenes and associated exhibits.....	85
2.3.3	Eye-tracker Verbal Protocol Framework.....	87
2.4	Interim review: Exposing the limitations of eye-tracker technology and the move to the real world environment to study individual Volume Crime Scene Investigator practice.....	89
2.4.1	Examining the role 'Tools' play in work as additional evidence for the move to observe real world practice. ....	91
2.5	Study 2: A methodology to capture crime scene investigator practice using head-mounted camera technology in the real world environment. ...	93
2.6	VCSI project initiation and ethics.....	94
2.7	The Interview process.....	100
2.7.1	Interview rationale .....	102
2.7.2	Role Profiles .....	103
2.7.3	Reflection diary .....	104
2.7.4	Using Head-mounted Camera Technology and the Digital Video Recorder (DVR).....	107
2.7.5	Data Coding and Analysis.....	113
2.7.6	Using NVivo 9 to collate and make sense of data. ....	114
2.7.7	Comparing Tech 5 with verbal recorded data.....	116
	Conclusion .....	119
3	Chapter 3 Results and Initial Analysis.....	120
	Introduction .....	120
3.1	Eye-tracker ' <i>own point of view</i> ' still images taken from video recordings.....	122
3.2	Eye-tracker ' <i>own point of view</i> ' graphical representation of data ....	126

3.2.1	Mann-Whitney U Test results for the Number of Comments between the two groups. ....	127
3.2.2	Mann-Whitney U Test results for the Video Analysis .....	128
3.2.3	Mann-Whitney U Test results for Examination Time between the two groups. ....	129
3.3	Head-mounted camera field study results.....	129
3.3.1	Reflection Themes .....	129
3.3.2	Describing the Scene.....	130
3.3.3	Evaluation of self and the crime scene. ....	132
3.3.4	Evaluation of Practice.....	139
3.3.5	Analysis.....	142
3.3.6	Interpretation and Reconstruction.....	144
3.4	Explanation of the Physical and Verbal nodes. ....	147
3.5	Head-mounted camera image quality.....	149
3.6	Robustness of Equipment and recording formats.....	152
3.7	Presentation and discussion of Dendrograms, Jaccard Coefficient Tables and Cluster Plots. ....	152
3.8	Nodes clustered by coding similarity.....	154
3.9	Frequency counts of intelligence not included in the Tech 5 Scenes of Crime Report Form. ....	165
3.10	Interview transcripts: What makes a VCSI? .....	166
3.10.1	Theme: Sense of Identity .....	166
3.10.2	Theme: Experimenting with resources.....	168
3.10.3	Theme: Sharing Awareness and Tacit Knowledge .....	173
3.10.4	Theme: Working Practices.....	180
3.10.5	Theme: Managing expectations.....	180
	Conclusion .....	182
4	Chapter 4 Discussion .....	184
	Introduction .....	184
	Aligning and mapping the results with literature.....	185
4.1	185	
4.2	Discussion of eye-tracker results between novices and experts (SOCOs).....	187
4.2.1	Quantitative data analysis.....	187

4.2.2	Qualitative data analysis.....	189
4.3	Resourcing on-site support: a review of the process.....	194
4.3.1	Reliance and guidance from mentor, supervisor and peers.....	195
4.4	Describing, Evaluating and Analysing: A review of these reflection themes and their importance in the development of novices.....	196
4.5	Examining spatial plot data and its significance in explaining practice.....	202
4.5.1	Interpreting clustered nodes.....	204
4.6	Examples of clustered practice.....	208
4.6.1	A study of the clustered nodes: <i>Communication and Gather Information</i> .....	208
4.6.2	A study of the clustered nodes: <i>Documentation/Preservation/Recovery and Packaging of exhibits</i> .....	215
4.6.3	A study of the clustered nodes: <i>Powdering and Evaluation</i> .....	221
4.6.4	A study of the clustered nodes: <i>Analyse, Visual searching/examination, Strategy and Resource selection/preparation</i> .....	227
	Conclusion.....	245
5	Chapter 5 Recommendations.....	247
	Introduction.....	247
5.1.1	A need to better understand forensic practitioner practice before deciding on how to measure it.....	247
5.1.2	Appreciating the importance of reflection in developing the forensic practitioner.....	248
5.1.3	Value research that assists in providing tools to understand performance.....	249
5.1.4	Understanding the different stages to being an expert forensic examiner.....	250
5.1.5	Creating a library of exemplars for forensic practitioners, mentors and supervisors to use in assessment and moderation.....	251
5.1.6	Understand the complexity presented in the role of the Volume Crime Scene Investigator and find alternative ways to measure performance that have worth. 252	
	Conclusion.....	254
6	Thesis Conclusion.....	255
6.1.1	Capturing performance.....	265
6.1.2	Meeting the requirement of the gate keeper: Participating North East of England police force.....	266



6.1.3 Future vision.....	268
References .....	270
Appendix A: Eye-tracker research day e-mail briefing to participants .....	285
Appendix B: Head-mounted camera field study handbook .....	286
Appendix C: Head-mounted camera Police Project Initiation Document.....	297
Appendix D Examples of key performance indicators used by North East and Midlands police forces.....	311
Appendix E: Example of consent form provided to the aggrieved party.....	312
Appendix F: Published outputs from thesis.....	313
Output paper:.....	313
Appendix G: DVD containing VCSI Crime Scene Videos, Verbal Protocol Transcriptions, Consent forms (where appropriate) and Tech 5 Scenes of Crime notes, NVivo 9 software program file and transcription of interviews. (HELD SEPARATELY TO THE THIS THESIS).....	315

**Figure Numbers and Titles**

Figure 2.1 Photograph from Unsworth (2001) showing a head-mounted camera and back pack..... 111

Figure 2.2 Photograph of author demonstrating the ER 14 head-mounted camera ..... 112

Figure 2.3 Photograph of the PV500 Digital Recorder and ER 14 Head-mounted camera . 112

Figure 2.4 Image of the PV 800 Digital Recorder ..... 112

Figure 2.5 Example of a completed 'Tech 5' report ..... 117

Figure 3.1 Participant (novice) makes comment about a fallen photo frame. Note eye-tracker cross-hairs locked. .... 123

Figure 3.2 Participant (Novice) searches room and makes comment about an open cash tin. Red cross-hairs locked. .... 123

Figure 3.3 Participant (expert) commenting on trainer design, colour and tread pattern. Red cross-hairs acceptable suffering only minor drift. .... 124

Figure 3.4 Participant (expert) examining window and observes force mark damage on the inside of the frame. Red-cross hairs suffering from drift however object is within the centre of the video frame. .... 124

Figure 3.5 Participant (expert) examining a bottle, note examiner uses overhead fluorescent light strip to illuminate marks post fingerprint enhancement. Torch is not used for searching. .... 124

Figure 3.6 Participant (novice) examining a bottle, note examiner uses a torch and is more reluctant to handle and move the object during this examination process..... 125

Figure 3.7 Chart showing proportion of comments produced by the two groups SOCOs (experts) and Students (novices) ..... 126

Figure 3.8 Chart showing number of items viewed between the two groups SOCOs (experts) and Students (novices)..... 126

Figure 3.9 Chart showing Time in seconds for the two groups SOCOs (experts) and Students (novices) to examine the two simulated scenes..... 127

Figure 3.10 Photographic still image taken from recorded head-mounted footage of VCSI photographing a vehicle. .... 149

Figure 3.11 Photographic still taken from recorded head-mounted footage of VCSI securing seatbelt. .... 150

Figure 3.12 Photographic still taken from head-mounted footage of VCSI taping seatbelt. .... 150

Figure 3.13 Photographic still taken from head-mounted footage of VCSI examining evidence under a magnifier and light. ....	150
Figure 3.14 Photographic still taken from head-mounted footage of VCSI examining an outbuilding. ....	151
Figure 3.15 Photographic still taken from head-mounted footage of VCSI searching crime scene case. ....	151
Figure 3.16 Photographic still taken from head-mounted footage of VCSI fingerprinting..	151
Figure 3.17 Dendrogram showing nodes clustered by coding similarity for Participant 1..	154
Figure 3.18 3 Dimensional spatial plot for nodes clustered by coding similarity for Participant 1.....	156
Figure 3.19 3 Dimensional spatial plot for nodes clustered by coding similarity for Participant 1 (rotated further in x plan to present nodes). ....	156
Figure 3.20 Dendrogram showing nodes clustered by coding similarity for Participant 2..	157
Figure 3.21 3 Dimensional spatial plot showing nodes clustered by coding similarity for Participant 2.....	158
Figure 3.22 3 Dimensional spatial plot showing nodes clustered by coding similarity for Participant 2 (rotated further in x plan to present nodes). ....	158
Figure 3.23 Dendrogram of nodes clustered by coding similarity for Participant 3. ....	159
Figure 3.24 3 Dimensional spatial plot for nodes clustered by similarity for Participant 3.	160
Figure 3.25 3 Dimensional spatial plot for nodes clustered by similarity for Participant 3 (rotated further in x plan to present nodes).....	160
Figure 3.26 Dendrogram for nodes clustered by coding for Participant 4. ....	161
Figure 3.27 3 Dimensional spatial plot for nodes clustered by similarity for Participant 4.	162
Figure 3.28 Dimentional spatial plot for nodes clustered by similarity for Participant 4 (rotated further in x plan to present nodes).....	162
Figure 3.29 Dendrogram showing nodes clustered by coding similarity for all 4 participants. ....	163
Figure 3.30 3 Dimensional spatial plot showing nodes clustered for all 4 participants. ....	164
Figure 3.31 3 Dimensional spatial plots showing nodes clustered for all 4 participants (rotated further in x plan to present nodes).....	164
Figure 3.32 Showing frequency counts of intelligence not included in the Tech 5 Scenes of Crime Report Form. ....	165

Figure 4.1 VCSI writes on an acetate sheet as fibres are recovered from a section of insulation style tape.....	217
Figure 4.2 VCSI documents gel lifts on a tilt top garage door: directional arrow applied...	217
Figure 4.3 Documentation is applied to a box: post gelatine lift.....	218
Figure 4.4 Still photograph of VCSI filling out a CJA label .....	218
Figure 4.5 Participant 1 filling out the CJA label on evidence bag.....	219
Figure 4.6 VCSI completing documentation on fingerprint lift.....	219
Figure 4.7 VCSI writing a direction arrow on the lifting tape. ....	220
Figure 4.8 VCSI writes on the swab tube. ....	220
Figure 4.9 VCSI documents lifting tape with a directional arrow. ....	220
Figure 4.10 Screen shot displaying coding stripes 'Evaluate, Powdering and ID Forensic Evidence' .....	225
Figure 4.11 VCSI prepares the surface prior to the examination .....	229
Figure 4.12 VCSI selects the appropriate lifting medium .....	229
Figure 4.13 VCSI measures out the amount of gelatine lifter required.....	229
Figure 4.14 VCSI searches the object using a torch .....	230
Figure 4.15 VCSI selects and begins using magneta powder .....	230
Figure 4.16 VCSI searches through her crime scene case for a resource .....	230
Figure 4.17 Participant 4 selects resources (gloves) prior to the examination .....	232
Figure 4.18 Participant 1 selects resources (plastic bag) from the crime scene case .....	232
Figure 4.19 Participant 1 selects resources (torch) from the crime scene case .....	232
Figure 4.20 Participant 1 selects resources (a fingerprint template) .....	233
Figure 4.21 Participant 1 selects resources (a fingerprint brush).....	233
Figure 4.22 Participant 3 selects resources (swabs) .....	233
Figure 4.23 Participant 3 selects and prepares resources (camera).....	234
Figure 4.24 Participant 3 prepares packaging material .....	234
Figure 4.25 Participant 3 tapes and recovers fibres from a vehicle seat.....	234
Figure 4.26 NVivo 9 screen shot showing multiple coding for a section of video .....	237

Figure 4.27 Folded section of lead and holdall, examined by Participant 3 ..... 244

## **Table Numbers and Titles**

Table 1.1 Selection of ENSFI CSI standards .....	47
Table 1.2 Structure and language: A analysis of a selection of Skills for Justice NOS CN 101 Develop Forensic Strategy for investigations. ....	50
Table 1.3 showing mapping across 3 proficiency scales .....	52
Table 2.1 showing category framework used to analyse verbal statements .....	87
Table 2.2 Coding framework for missing data not contained in the Crime Scene Report Form .....	119
Table 3.1 Example of reflection comments presenting the theme <i>Describing the Scene</i> ...	131
Table 3.2 Reflection comments presenting Sub-theme Attitude and Behaviour .....	133
Table 3.3 Reflection comments presenting an evaluation of how task or processes were performed .....	134
Table 3.4 Reflection comments presenting variables that influence forensic recovery .....	135
Table 3.5 Reflection comments presenting crime types and the likelihood of forensic evidence recovery .....	136
Table 3.6 Reflection comments presenting time and actions as variables.....	137
Table 3.7 Reflection comments presenting the sub theme Evaluation of Practice.....	139
Table 3.8 Reflection comments reaffirming practices or justification of practice .....	142
Table 3.9 Reflection comments exploring the analysis of the surface to be examined .....	143
Table 3.10 Reflection comments presenting sub-theme Interpretation and Reconstruction .....	145
Table 3.11 Presenting nodes and their corresponding explanation as derived from advertisements, literature and role profiles.....	148
Table 3.12 Showing clusters and associated strength of the Jaccard's Coefficient for Participant 1 .....	155
Table 3.13 Showing clusters and associated strength of the Jaccard's Coefficient for Participant 2.....	157
Table 3.14 Showing clustered and associated strength of the Jaccard's Coefficient for Participant 3.....	159
Table 3.15 Showing clustered and associated strength of the Jaccard's Coefficient for Participant 4.....	161

Table 3.16 Showing clustered and associated strength of the Jaccard's Coefficient for all 4 participants ..... 163

## Introduction

### Concept and background

Crime scene examination has seen significant popularity for over a decade, mostly notably in the media and television based dramas. Surprisingly however little research has been conducted into how these examiners perform their tasks at volume crime scenes or indeed how they develop their expertise in the role. Literature has tended to measure performance on the recovery and identification of forensic products with little attention on methodologies to understand investigator practice. This thesis examines this literature and also presents an alternative view. It proposes that to develop Volume Crime Scene Investigators (VCSI), first requires an understanding of their practice, more specifically how they perform in the role. This understanding is indifferent to (but supports) numerical measurement. Instead it focuses on how the practitioner makes decisions at volume crime scenes, their engagement with the public as well as how they become socialised into practice within their place of work. What can be learned from using this Grounded Theory ethnographic approach (Glaser and Strauss, 1967) and what benefits it can offer traditional methods of grading performance, forms the central theme to this work. The penultimate section of this thesis presents a series of recommendations. These recommendations aim to assist VCSI development; they also explain other useful measures that should be viewed with the same strength as current metrics.

There has been much change in this domain over the last decade that has seen competency style registration for Crime Scene Examiners come and go as well as new introductions of quality management frameworks that now form the backdrop to accreditations and assurances of good practice. Furthermore the role is performed extensively by civilian staff except for those serving in the military.



The basis for this research is that there has not been a serious analysis of the literature that explores the development of the crime scene practitioner or what strategic path this should take. Neither have alternatives to recording performance been explored. This thesis presents a view that this has mostly certainly occurred in other dynamic domains such as nursing, with much benefit. Moreover, observation methodologies in other domains are so abundant that they have developed their own field of research.

The concept of *expertise development* is therefore important to recognise and understand. Asking questions such as how is Volume Crime Scene Investigator work measured? And whether parts of the role are missed by current metrics leads to the view that this is a fertile area to study.

The perspective of this research is not to ignore the value of the National Occupational Standards or current key performance indicator metrics in this domain. Instead it seeks to understand the practicing nature of this work, expose what expertise is, how it is developed and what can be learned by observing practitioners in this way.

The following four research questions provide the structure to this thesis, with each section and chapter contributing to the answers. The Conclusion to this work will also provide a synopsis for these questions and detail where future research should be directed.

### **Research questions and thesis overview.**

- Question 1. What is the role of the Volume Crime Scene Investigator and where does it sit within UK Policing?
- Question 2. What metrics, competency standards and professional bodies measure or assess Volume Crime Scene Investigator work?
- Question 3. Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?

- Question 4. Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?

The first question

*“What is the role of the Volume Crime Scene Investigator and where does it sit within UK Policing?”*

This question is important as it pulls together material from a wide variety of texts to assist in understanding how this work is organised and performed. It focuses on the history of the role, how it came to being and includes the constraints that impact on the Volume Crime Scene Investigator. The role is known by many titles, each of which is discussed, showing how diverse this is across the United Kingdom. Extending out of this title is also a perspective or view point of where the role sits within the criminal justice system and the forensic science sector. This last point provides one of the most interesting and stimulating debates within the industry, this being the role of the expert witness and where the VCSI is positioned in relation to this.

The second research question:

*“What metrics, competency standards and professional bodies measure or assess Volume Crime Scene Investigator work?”*

This question covers the National Occupational Standards (NOS) set by Skills for Justice that are used to construct role profiles for the profession and assess competence. Alternative standards by the European Network of Forensic Science Institutions are also presented. This question also includes examples of how Police Forces measure their staff in terms of performance indicators and development processes for those new to the role.

A history of professional bodies is also discussed for this role and where the sector is moving to in the future, certainly in terms of accreditation.

International Standard Organisation 17020 and 17025 at the time of writing is being implemented for Crime Scene Investigators, chemical enhancement laboratories and forensic evidence recovery laboratories in UK police forces. Literature from principally the last decade captures the culture that has

dominated research outputs in this area. Questions are posed that offer alternatives to current methods of assessing and developing practitioners.

This leads onto the third research question:

*“Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?”*

The first two questions are answered within the literature review in Chapter 1. This third question is split, in that the concept of expertise and its development is presented as part of the literature review however the methodology element moves to Chapter 2. Grounded Theory tools and qualitative inquiry are used as an alternative to the dense positivistic literature of the last decade to find new ways to understand the forensic practitioner role. Here ergonomic quantitative methods overlap with ethnographic tools to assist in furthering understanding in this domain.

Chapter 2 is separated into a number of distinct parts. The first being a detailed explanation of a pilot study using eye-tracker technology in a simulated environment to better understand searching strategies between novice and expert Crime Scene Investigators. It explains the participants, their background and why they were chosen for this short study<sup>1</sup>. The purpose of this study was to identify differences between the groups, draw out themes which were then compared to employment role profiles and then ascertain if these are captured in existing metrics.

A section is provided briefly explaining the results and reasoning behind how this method informed the main ethnographic field study; full analysis of the results are dealt with in Chapter four. ‘Gate-keeper’ access and the preparation needed to begin field work features heavily in the Methodology section. The negotiation and preparation included aligning research outcomes to employer business plans; in this case the employer was a North East of England Police Force.

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<sup>1</sup> This research was in collaboration with Birmingham University

Head-mounted camera technology with supporting workshops, interviews, field observations and reflection diaries by the participants was used to capture this crime scene examination work. The last stage of this chapter explains the software used for this analysis: NVivo 9.

Chapter 3 presents the results from the eye-tracker experiments and head-mounted camera study. It also covers themes developed from the interviews and where appropriate, this is supported by transcripts. Early indications to the themes can be seen in the charts and spatial plots however a full interpretation of the material is covered in Chapter 4.

The fourth research question:

*“Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?”*

This is a natural progression of implementing the methodologies explored in question three however the results go further in that they are used to identify what is now known that cannot readily be identified using existing performance indicators. Moreover it also provides some answers in how domain standards can be delivered to measure performance. The results are discussed in Chapter 4 however what value these methodologies bring to existing indicators and others is expressed in the Recommendations section of this thesis, Chapter 5. Chapter 4 pulls apart the differences between development of expertise and metric indicators. This chapter explains the results in depth and connects this new knowledge with the research questions. It explores what is now known, what is significant and importantly gives the Recommendations Chapter the space to identify the current gaps in knowledge.

## 1 Chapter 1 Literature Review: Exploring Crime Scene Investigation and the use of expertise theories as a basis for exposing and developing practitioner performance.

### 1.1 Modern historical overview of the Crime Scene Investigator and research in this domain over the last decade.

In the last decade and as a result of the DNA expansion project within the United Kingdom (UK), police forces recruited staff to attend specifically volume crime (Fraser, 2007). These practitioners in the UK are known as Volume Crime Scene Investigators (VCSI).

Burrows (2004) provides a snapshot of the events and evolution of the changes in forensic science notably the requirement for more scenes to be attended by Crime Scene Examiners (the term SOCO is used). Burrows (2004) also explained the £182 million pound government investment and that the attendance of more scenes generally leads to more evidence and intelligence being generated. This is argued to increase the number of crimes detected. It is at this early juncture that the VCSI role was born to capitalise on this investment moreover it was in 2000 that the National Training Centre for Scientific Support to Crime Investigation began delivering courses to specifically train VCSIs.

Burrows acknowledges the counter argument that SOCOs were already selecting the scenes likely to generate the most forensic opportunities, although still quotes Her Majesty's Inspectorate of Constabularies report *Under the Microscope* (2000) that:

*evidence is found in the same proportion irrespective of how many scenes are visited. ... Put simply, the more SOCOs, the more scenes visited, and the more crime detected.*

This is again supported by Green (2007, p.347) and that this influence explains the push for Volume Crime Scene Investigators to deal with this specific level of crime.

Despite this route to professionalise the role of the Crime Scene Investigator much confusion still exists as to the power or credibility of the CSI.

The terms Crime Scene Investigator and Crime Scene Examiner are used interchangeably throughout this thesis, except where reference is made to the ethnographic study or research questions. Here the proper acknowledgement is given to the title of the participants that took part in the research and consequently 'Volume Crime Scene Investigator' is used.

The term 'Crime Scene Investigator' whilst frequently used in Home Office doctrines and circulars, is not universally accepted in every police service. Furthermore this label has not always been in existence. Practitioners in the last three decades have been known as Scientific Aids (Cooke and Ide, 1985, p. 43), Scientific Support Officers, Scenes of Crime Officers (Trueman, 2009, p. 37-41; Laycock, 2005, p. 7; Webb, Smith and Brock, 2005, p. 169), Crime Scene Examiners, Forensic Investigators, Crime Scene Investigators, or Volume Crime Scene Investigators and Assistant Scenes of Crime Officer<sup>2</sup> (Fraser, 2007, p. 389-390). The Metropolitan Police also are not alone in using the term 'Forensic Practitioner'.

However in all of these descriptions the role and function is largely the same with different terminology adopted by each police service. It is important to comment that the Scottish Police Authority under Forensic Services (SPA, 2013) make reference to 'Scenes of Crime Officer'. South Wales and Gwent Police state 'Crime Scene Investigators' (South Wales Police, 2013). Interestingly Dyfed-Powys Police (Dyfed-Powys Police, 2013) have *Scenes of Crime* as a forward facing label but with individual Police Officers quoting the title *Crime Scene Investigator* in web news feeds. Police Service Northern Ireland however globally use the term 'Crime Scene Investigator'. Conversely West Midlands Police recognise that examiners will attend scenes that are not always going to be labelled as a crime and so use the definition Forensic Scene Investigators.

Elmhirst (2010, p. 29) in describing the crime scene and the role of the practitioner helpfully explains that the changes in title is due to "*innovative*

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<sup>2</sup> Assistant Scenes of Crime Officer denotes practitioners that are utilised to examine high (volume) frequency crime.

*management thinking*". This point however is not supported by other sources or research on the subject. There is also no evidence that across the UK the titles have changed in unison. Moreover current role profiles and advertisements suggest that titles are different across the UK at any one time.

It is apparent within the United Kingdom the term used to label the role is different in different police forces even if those police forces border each other. This to the uninitiated can be confusing and can be compounded further by historic terminology. For example the term 'Studio' in Leicestershire Constabulary was once used to describe crime scene personnel, although its 'public' outward facing reference was 'Scenes of Crime Officer.' This phrase was used in fingerprint, forensic as well as photographic requests by Police Officers.

### **1.1.1 Crime Scene Training**

The changes in the training of this role can be seen in the recognised academic qualifications for Crime Scene Investigators, these have only been in existence since 1994 with Durham University accrediting the first diploma. This name change can be observed in the post-nominals awarded to successful students, with a Diploma in Scientific Support Skills, being the first, followed by a Diploma in Crime Scene Examination in 2000.

Changes have been made to the current College of Policing scenes of crime training, a factor recognised by Roux and Robertson (2009 p. 586-588). The current method of delivery has moved away from a series of long residential courses with much more emphasis on learning in-house and distance learning. It should be stated that whilst on the face of it this appears innovative others have proposed this route decades before (Brightman, 1993). Reflection and self-awareness is becoming more apparent in this training however it is still failing to be developed and promoted in research literature.

Teesside University have since accredited Crime Scene Courses in partnership with the then National Police Improvement Agency (NPIA, formerly known as Centrex), now known as College of Policing. Diploma qualifications have been replaced with a work based learning two years Foundation Degree in Crime Scene Investigation.

This recent history is interesting as Fraser states that prior to 1990, training for CSI was *“patchy and fragmented”* (Fraser, 2007, p. 390). It was the Home Office commission of the Touche Ross report in 1987 that recommended a National Training Centre for Scientific Support to Crime Investigation, at the time a crime scene training wing of Durham Constabulary. In later years this branch was disconnected from Durham Constabulary and positioned in the Home Office under the umbrella of CENTREX (Centre for Policing Excellence) following a report from Her Majesty of Inspectorate of Constabularies (HMIC) in 2000.

Although a national picture has been presented there have been a small number of police forces that have trained their own crime scene staff to some level, for example Kent Constabulary (Fraser, 2007, p. 390). Furthermore The Metropolitan Police have also changed the design and delivery of their crime scene training, whilst different to the College of Policing program it still focuses on work based learning with reflection playing a serious part to learning. More interesting is that the title of the degree is a Foundation Degree in Forensic Investigation. This is seen as a significant step to acknowledging the broader aspects of the role. The purpose is not to challenge and state that this is a new way of working, but these changes do recognise the deeper levels to the role. The following section begins to unpack what skills are needed and the importance placed upon them.



## 1.2 Volume Crime Scene Investigator and Crime Scene Investigator roles: Exploring skills, culture and theory.

The term 'investigator' has become more apparent in referencing the role of the Crime Scene Examiner; an example is in ACPO (2005) *Practical Advice on Core Investigative Doctrine*. The part played by the crime scene practitioner is recognised as having a key role in collating and making sense of intelligence. There are perhaps other advantages or indeed recognitions to this change in name.

Stelfox (2009, p. 126) identifies two significant features that should occur at crime scene examinations: one being "*interpretation of the circumstances*" that is what has occurred and where did it occur, and from this analysis, conclusions are drawn as to the location and type of event that has occurred. It is interesting that evidence is not merely cited as identifying or implicating a suspect but has other interpretative elements. Consequently the role of the examiner is more complex. All this is clearly a departure from perspectives three decades ago where:

*"The SOCO is not an investigative officer as such"* (Cooke and Ide, 1985, p. 43-44).

The Core Investigative Doctrine (ACPO 2005) positions the practitioner as 'Investigators' which has also been supported by legislative power, furthermore it also begins to explain the changes in role profile titles and training programs. Additionally this doctrine comments that interpretation of the circumstances requires assimilation of data in order to formulate an understanding of the past events. This is important to note as it is possible to see a serious acceptance of decision making and opinion based reporting within the role. This however does raise a conflict within the culture of Crime Scene Investigation and what is meant by an expert witness, this clearly has an impact on how the role is understood by the practitioner.

The Core Investigative Doctrine (ACPO, 2005, p. 21) is one of the earliest policy documents that identify CSIs as experts. This phraseology is present

throughout the document situated alongside Forensic Scientists, Home Office Pathologists etc. Other material is much less clear on this issue, more conspicuous by the absence of CSI under the title of 'expert witness'. Trueman (2009, p. 261-262) still echoes this perception of expertise with the biggest concern being in relation to giving evidence. He states that witnesses overall do not provide an opinion and should confine themselves to factual matters. This being especially important in relation to hearsay evidence, that is reporting on what someone else saw or heard. He is clear on who and what an expert witness can do and who they are:

*"Witnesses, who by their knowledge and/or experience are able to assist the court with such an issue, are classed as experts. For example pathologists, doctors and scientists are given expert status."*

He goes on to say that the Scenes of Crime Officer (SOCO) is not usually classed as an expert "per se." (p. 262) with a short caveat saying that provided questioning falls within their knowledge and they are "sufficiently experienced" then the court may allow such evidence. The Stewart Research (Final Report March 2009, p. 11) *Civilianisation of the police in Scotland* agrees with this statement:

*"Despite this, SOCOs do not have "expert witness" status as recognised by the British judicial system, although they can be asked to give testimony based on opinion at a judge's or magistrate's discretion."*

Rothwell (2004, p. 419) and Weston (2004, p. 26) whilst being clear that Forensic Scientists are expert witnesses make no mention of Crime Scene Investigators falling into this category. Although they do see that the role is not merely process or task orientated but requires high level cognition skills. Weston expands on the photography, preservation and collection of trace evidence and describes a shift in their function

*"...taking an increasingly advisory and investigatory role in crime investigation using technical knowledge, crime intelligence data-bases and also by exercising their professional judgment."*

Weston goes on to cite a name change to Scenes of Crime Officers from the previously mentioned label of 'Scientific Support Officer' but does not make reference to the term Crime Scene Investigator. Elmhirst (2010, p. 29) is more direct:

*“Police employed crime scene examiners are not usually recognized as ‘experts’ by the courts. Therefore, their evidence has to be confined to facts and not opinions – unless the judge gives them express permission.”*

There is also a protective element as to ‘who’ is allowed to enter the sphere of the expert witness, even challenging the label *experts* and *expertise* which are separate to being an expert witness. A respondent cited in *Police Professional* editor’s letters (Brown, 2009) makes this clear. Here the fingerprint expert challenges the use of the term *expert* crime scene examiners. The article he refers to makes reference to expertise and expert performance in crime scene examination, wholly separate and unrelated theory to being an expert witness. Nevertheless the terminology is too much for Brown and misunderstanding results.

*“...made repeated reference to the term “expert” when referring to highly-proficient crime scene examiners. While in everyday parlance this is acceptable, when referring to potential witnesses I would challenge the use of the word expert. An expert witness is defined as a person having special training or experience in a technical field who is permitted to state his or her opinion on matters relating to that field even though he or she was not present at the event; this does not include crime scene examiners. I have not yet read the Cambridge Handbook of Expertise and Expert Performance mentioned in the article, but I doubt that its title refers to expert witnesses but more probably to highly-skilled practitioners.”* (Brown, 2009)

Evidently there is much confusion over the expertise of Crime Scene Investigators and their ability to afford expert opinion in court.

The explanation on the role provided by Elmhirst is detailed, with distinction made at every junction between major and volume crime. The two components that link to the cognitive functions described above lie in the explanation of the *Scene Assessment* and *Forensic Assessment*. It is possible to see the beginning of how the role is organised and what is required to perform the task of a crime scene practitioner. These two processes detail how examiners need to make decisions and judgments about the scene. These may be in relation to the weather or in the forensic opportunities in the scene itself. In volume crime, preceding events are likely to be found on the police log, this log lists not only when the complainant made the call but the response and information provided from those that have attended the scene. The Crime Scene Examiner or Volume Crime

Scene Investigator consequently has a historical catalogue of what has been reported and the likely areas for examination. Elmhirst (2010, p. 33) states that should this hypothesis be insufficient or does not fully explain these postulated occurrences, then the examiner should construct their own hypothesis.

Bruschi, Monga and Martignoni (2004) examine the work of digital forensic detectives.

*“a good detective must perfectly know what to look for, where to look and how to look while limiting the possibility of evidence compromise to a minimum. However, in order to achieve these results, skilled and experienced personnel is needed. As a matter of fact, crimes present common patterns that could be exploited to ease the work of investigators, **but this knowledge is often tacit, only partially shared with colleagues, and mainly disorganized.**”*

Clearly a fundamental skill lies in being able to test information against recorded observations and that lines of enquiry should explore avenues that anchor thinking around a construction based on observations and supporting information. These seem to chime with that of an expert witness reporting an opinion based on scientific evaluation. In addition the reference to a tacit understanding begins to present a view that to do this or indeed similar work requires a deep understanding of the cues within the crime environment, a skill evidently valued by Bruschi, Monga and Martignoni.

Doak and Assimakopoulos (2010) recognise that tacit knowledge is essential even in highly procedural domains such as forensic science. This is an example where Standard Operating Procedures (SOP's) form the backbone of scientific enquiry, to ensure contamination; continuity; evidence and intelligence is managed.

It can be said that knowledge is posited to exist in two forms: explicit and tacit. Doak and Assimakopoulos explain that explicit knowledge goes beyond SOP's it also incorporates pictures, drawings, manuals, all of which are apparent in the forensic science and the crime scene community. Despite these formalised processes entrenched in practice it was found that a significant amount of the knowledge needed was indeed tacit, coupled with that only explicit knowledge is accredited. The interesting route to

ascertaining tacit knowledge is important for consideration in that it is fundamentally qualitative in nature using narrative analysis, coding as well as exploring the frequency of this coded material. Moreover *“additionally, the traditional qualitative school of inquiry was used.”* This was coupled with participant observation and semi-structured interviews. The methods and procedures used to answer Doak and Assimakopoulos’s research question come from inquiry based research where Grounded Theory tools forms the backdrop. This inquiry exposed that tacit knowledge is necessary to function to *“think outside the box”* furthermore it is explicitly needed to support SOP’s. Building on this it is interesting that they comment on only explicit knowledge being recognised, a factor to be commented upon later where only forensic products are recognised and used in performance monitoring.

Nicholls and Cargill (2008) also recognised that SOP’s no matter how complex or intricately constructed do not cover every eventuality. Evidence is presented that reflection and tacit awareness is necessary, and is important in expertise development along with understanding the realities of real world work.

The concept of reflective thought around this point is discussed by Dewey (1910, p. 12). He suggested that ‘thinking’ does not materialise for the sake of it, instead there is a need for its creation. The beginnings of this thinking centre around, the:

*“formation of some tentative plan...the entertaining of some theory”.*

Efforts are needed that accumulate more data since the presented data is insufficient to deal with the problem or uncertain interpretation. Prior experiences of a similar nature naturally lend themselves to providing a useful trusted solution, failing this, new theories are required to emerge or *“confusion remains.”* Dewey was honest in that reflective thinking brings with it frustration, a sense of mental suspension in terms of progress until the problem or opaqueness of the situation is solved or event made clear. The skills needed to deal with this *“somewhat painful”* (p. 13) process may be found in a sense of acceptance and that this is merely a stage. Dewey’s

undertones hint that insecurity needs recognition as a state in its own right and that the temptation to try many different possible solutions in the vain hope that this uneasy state will quickly evaporate needs to be shunned, with answers only being found in a “*systematic and protracted inquiry*”. Schön’s description of reframing a problem through reflection is a way out of the “swampy lowland” (1983, p. 1). Moreover these confusing states are found on the periphery of one’s own competence. Schön’s standpoint position is clear if not non-participatory in that choices have to be made, the high ground consists of problems that can be met with easily constructed solutions, but be prepared that overall these problems may be of no real consequence to the specific society of practice in question. The “swamp lowland” is where very real and important issues are based, problems that the average practitioner would struggle to solve. Those that can survive in these harsh environments are unfazed by confusion or challenges.

Schön and Dewey appear to be discussing the same issues crime scene practitioners face. These are instances of examinations which are complex and require significant interpretation or skilled interviewing in order to separate fact from supposition. However it should be recognised that this is not the only guise in which this is presented. A phenomenon to be explored in this section is ‘tacit knowledge’, its attainment and how it is used in professional judgement to deal with these complex problems.

### **1.2.1 Knowledge Types and their role for the crime scene practitioner.**

Tacit knowledge has two methods of acquisition: ‘direct’ and ‘indirect’. Cianciolo *et al.* (2006, p. 623), state that ‘direct tacit knowledge relates principally to being informed of an approach, or method. The knowledge is shared in some form with the only difficulty concerning whether the meaning carried in the transmission of this knowledge is understood or its usefulness appreciated. Indirect tacit knowledge however is developed through reflection, whilst reflection is not explicitly stated the subtext is evident with a push towards uncovering tacit knowledge for oneself:

*“improving people’s ability to engage their environment and learn from experience.”*

Furthermore it is recognised that expertise is not only developed through experience but that *“methods that stimulate the process of thinking...”* such as *“talking about it with others, will facilitate the development of expertise.”* It is evident that conversations and the context of when these occur are critical and consequently are discussed in more depth in this chapter. What is apparent at this juncture is that the act of telling transmits tacit knowledge in an overt way (or where opaqueness obscures an event) and allows others to offer tacit knowledge. It is also an opportunity for the teller to engage in reflection. The opportunities for this activity are evidently linked to expertise development, with reflection being fundamental for this development. Extending this argument further it should now be acknowledged that this is a skill in its own right with the same attention offered as if it were a psychomotor skill such as fingerprint enhancement. The key is to understand how it is practised by the examiner. The thread back to ‘scene assessment’ lies in this area of theory and consequently this area of volume crime scene work needs to be better exposed and understood.

These are important aspects to consider as Elmhirst (2010) spends much time on assessing the crime scene and the forensic opportunities within it. There is also recognition that the context of these situations are far from clear with advice to accumulate data to support or refute a theory. Reflection as a process and testing theories is evidently a skill for Crime Scene Examiners and is intrinsic to the work undertaken in the crime enquiry.

Following on the reflective theme, Elmhirst (2010, p. 42) writes that gathering intelligence is a precursor to formulating an examination strategy. It is acknowledged that *assessment* and *interpretation* of the scene are clearly key functions. Here the examination strategy moves through continuous refinement until the examiner is satisfied that a useful and stable outcome or opinion of the events is found. With refinement there inevitably involves an oscillation back and forth between the different reflection stages.

Johns (2009 p. 49-51) makes clear the practicalities of reflection by stating that it is not a linear or staged process. For the novice exploring the fundamentals it may be helpful to think of reflection and problem solving in these terms, in reality the function of reflection is significantly more complex. The notion put forward by Johns is a spiral, allowing easy connection between the different stages.

Elmhirst (2010 p. 25-26) suggests the intelligence gathering activity at a crime scene is mostly likely to be implemented during the crime scene walk through. A process whereby the VCSI walks through the scene often with the complainant and through questioning and observation builds a strategy of what needs doing. This strategy attends to vulnerable areas potentially being given precedence in the examination process. It is during this stage that the scene is assessed, explicit evidence evaluated and strategies constructed and refined. Elmhirst also suggests that the Crime Scene Examiner needs to deal with many unknowns, although posits that many of these unknowns can be made clear through having the complainant present. That aside the examiner may still need to deal with a wealth of exhibits from the scene. Threats from contamination and loss of continuity are clearly important aspects to manage and that “*wrapping up*” the scene in “*cotton wool*” (Elmhirst, 2010, p. 25-26) is not an option. Instead a carefully detailed examination is necessary that identifies key areas and (subsequently) potential exhibits for laboratory submission. It is more interesting to note that the term “interpretation” is used to describe an activity that sits alongside discussions concerning the recovery and packaging of physical evidence. This term is important and links with “professional judgment” mentioned earlier. On this point Rankin (2010 p. 9) also states that, examiners are:

*“specialists who have received extensive training in all aspects of crime scene examination.”*

Whilst there is no mention of interpretation nonetheless he does make clear that this is a specialist role whose task is to recover and record evidence, coupled with ensuring that the evidence is in a suitable state for a forensic laboratory examination. On this note Baber *et al.* (2006) make brief but



interesting reference to there being two schools of thought concerning interpretation, with only one position recognising that 'interpretation' is a part of the work of the Crime Scene Investigator. The debate relates to how:

*"...much leeway in terms of interpreting objects in terms of evidential value. One school of thought argues that the role of the CSI is to recover items that is as neutral as possible, to allow interpretation to be performed by other specialists, whilst another school of thought views interpretation as central to the CSI role."*

No further evidence is provided, however hints are made that there may be historical ontological perspectives that govern how these perceptions should be seen. This is not the only reference to this thinking, Garrett (2003) also hints at their being different standpoints this time within the United States:

*"Too few, however, involve themselves in an equally important aspect of their jobs: discovering what it all means. Some view their responsibility at a crime scene as merely the documenter of facts. Interpretation and analysis are left to someone else. But, depending on the size and structure of their agency, they may be called upon to provide an analysis of the crime scene or an opinion on the basis of their experience and training."*

It is now possible to see how reflection is an activity of crime scene work and to understand its function also allows understanding of Crime Scene Investigator practice. Moreover the scope of the work is connected with a view point of whether the individual sees themselves as an expert.

It is argued in this thesis that the recovery of any potential evidence requires some level of interpretation. Developing this point further means to accept that interpretation governs where to examine, with judgment on the quality and strategies needed for enhancing or developing latent trace evidence, such as fingerprints.

It is stated here that 'interpretation' (a fundamental element in expert witness testimony) is accepted in the laboratory forensic science sense but is not overtly expressed by, or for Crime Scene Examiners.

Dewey (1910 p. 17) offers some insight in that reflection enables "physical events and objects" to take on different meanings depending to whom they are presented:

*"a stone is different to one who knows something of its past history and its future use".*

Here Dewey (1910 p. 12-13), comments that past experiences present the reflector with knowledge, and it is through this knowledge that an appreciation, value or worth of the object/event is considered. Pepper (2010, p. 12) states that a skill of the Crime Scene Examiner requires him or her to “*think outside the box*”, little more is mentioned about this statement but it does connect with Cianciolo *et al.* (2006, p. 623) comment for the need to acquire expertise (or more specifically tacit knowledge), and engage with thinking that moves through the inertia to arrive at a satisfactory location. It is possible to now see how culture, operational practice and the acquisition of knowledge are interrelated.

Dewey does provide lessons for the practitioner as he states that pushing the notion of thinking about a problem is “*futile*” unless that individual faced with the problem has prior experiences where those “*same conditions*” have been made apparent.

Reframing the presentation of evidence in a court of law and purporting it as factual evidence (as described by Elmhirst), is evidently based on a construction. This construction of the crime scene is formulated from associated material such as police logs; first attending officer reports; the account by the complainant; as well as the observations and interpretations of the examiner. Each one of these requires interpretation. Therefore it must be acknowledged that a different interpretation of all the material could yield different intelligence and evidence being presented before the court. Even at a tacit level it is argued here that practitioners offer interpretative opinion based evidence wrapped up as factual material. This is a controversial statement as it begins to question if the examiner really does only present factual evidence, a point to be discussed further.

### **1.2.2 Scientific Support: Structure, standards and the focus of research in the last decade in this area.**

Green (2007) describes and explains the modern structure of Scientific Support Departments including the Touche Ross (1987) recommendations to civilianise the department. Green unpacks the outcomes of this report and that many examiners are based on Local Policing Units ultimately governed by a central Scientific Support Manager.

The modern day label of the Scientific Support Departments is still subservient to forensic science in its descriptive language however this aside the reference to “professional judgment” this time by the European Co-operation for Accreditation (EA-5/03 M: 2008) cannot be ignored and develops an argument that the role demands expert performance, with sufficient substance to exist as a forensic discipline in its own right. The EA-5/03 guidance document on implementing ISO17020 states:

*“A lot of professional judgement is applied in the investigation of crime scenes, for example, when deciding on the limits of the crime scene, the investigators have to use professional judgement based not only on the observations made at the scene but also on previous experiences.”*

It is important to recognise here that if professional judgment is necessary then it should be captured, monitored and assessed. Research questions three and four explore acknowledge this and it is proposed that through examining work development theories, an opportunity to better understand the work of the practitioner can be found. Furthermore it opens up the discussion where professional judgement will be found during the examination phase.

It was in relation to the above statement that the ISO17020 was implemented to use as a standard for examiners. This standard requires the police service (described as the organisation) to have procedures in place that document and justify the conclusion when professional judgements are made. A key theme in this chapter is to explore whether this is already captured in existing key performance indicators used to monitor practitioner performance. In

addition this thesis scopes out how examiners acquire professional knowledge during their 'socialising into practice'.

The Forensic Regulator has clearly defined forensic science to include science used in the investigative process (Rennison, 2009). This to some extent puts rest a question raised by Harrison (2006), in his paper "Is Crime Scene Examination a science, and does it matter anyway" in that the broader concept of science is acknowledged to include the work of Crime Scene Examiners. This recognition of what forensic science includes should stimulate thinking as to what kind of knowledge the police service needs, something Nikolou-Walker (2007) has been quick to seize upon. Although speaking as an organisation, there is clear emphasis by Nikolou-Walker that the traditional methods of acquiring knowledge is through training.

*"The 'soft' benefits of education, elements like critical thinking and emotional intelligence as well as learning, are rarely given sufficient emphasis. However, increasingly, organisations are realizing the benefits of creating an open environment that allows informal learning to flourish."*

A point to explore is whether these 'soft skills' are valued by the crime scene practitioner and indeed captured by performance indicators. Moreover it also explores where if at all these 'soft skills' are apparent in an investigators practice.

Research into crime scene examination has for some time concentrated on the *products* of the examination process and the use of technology generated by this occupation (Eleccion, 1973; Allinson, *et al.* 2007). There is now a focus on intelligence gathering, (Ribaux, *et al.* 2010) but still with comparisons on the frequency of forensic products such as fingerprint identification and DNA hits notably via data mining techniques (Adderley, Townsley and Bond, 2007; Bond 2007; Liu, *et al.* 2008, Adderley and Bond, 2008a, 2008b). Interestingly research in 'policing research' is beginning to acquire discourse of its own (Mazeika, *et al.* 2010).

### **1.2.3 Document analysis of key performance indicators**

A document analysis from selected North East and Midlands Police Forces in the UK shows the detail police forces go to in capturing frequency data on forensic products for their staff. I. Bailey a Scientific Support Manager (pers. Comm., 29<sup>th</sup> July 2013,) stated in an email that “no one person is good at all) and that to assist them in making performance assessments they required data from their forensic service provider. This data was not simply in reference to DNA identification but also extraction success rates from exhibits submitted by forensic investigators. He also explained how each practitioner is assessed; Appendix D presents examples of these metrics. However this is under review, moreover at the time of writing work is underway to merge or at least better collaborate with other scientific support units. These metrics are key performance indicators (KPI's) used to measure the scientific support role in detecting crime.

It should be noted here that practitioners early on in their career are indeed measured on more than simple frequency counts of fingerprint and DNA database hits. Evidence exists from police forces of detailed competency approaches and training, assessing fitness for purpose in the role. This evidence can be found in the framework in the Foundation Degree in Crime Scene Investigation by the College of Policing and also the provision offered by the Metropolitan Police.

Outside of these formal training institutions evidence exists of one police force using their own internally designed training manual for new recruits post formal training, this manual was in excess of two hundred pages. It should be acknowledged that these same standards and methods were not used on those out of training and well ingrained in the role. For these practitioners frequency data is still the primary method to assess performance, with targets set by the Scientific Support Manager of 8 to 8.5% of crime scenes attended yielding a fingerprint identification depending on the police force in question. Those that fail to meet these targets are warned that repeated failure will be met with action plans and close supervision (Johns, pers comm

1<sup>st</sup> July 2013). This thesis does not query the rightfulness of this approach merely to acknowledge that targets and KPI's of a frequency nature are demanded by the Association of Chief Police Officers (ACPO), and that the level of targets set for each CSI are not uniform across the UK. In essence each constabulary's Scientific Support Manager is free to assess and measure their staff using any method they see fit, provided that at least one method is adopted that captures and presents frequency counts of forensic products.

A detailed framework that captures practitioner performance as it occurs does not exist, nor is there any evidence of practitioner assessment based on how they perform being moderated between forces, as is the case in education. There is also no evidence of an alternative view to measuring practitioner performance with a view to developing the practitioner. This thesis explores this point and develops methodologies and frameworks to provide an alternative. This alternative captures evidence that will benefit practitioners and the policing organisation, which can supplement the positivistic data already being captured.

Data mining techniques has been a principal focus in the literature with an aim to measure the performance of Crime Scene Investigators. Here multiple variables are inserted into statistical software programs to produce clusters. These clusters highlight CSIs that are successful in recovering fingerprint and DNA material from a scene. The conclusion to this work is to devise methods that suggest a suitable solution for managers to identify good performers. This is evidently not an easy task when the attendance of crime scenes is varied, over some defined time frame. Adderley, Townsley and Bond (2007) comment that:

*“Their development could be tailored around joint deployment with a CSI in any other cluster, i.e. those with a high collection rate for at least one forensic data type. Those CSIs in a cluster typified by deficient collection of one forensic type would benefit from time spent with CSIs from clusters with high collection rates of that forensic type; and so on.”*

The benefits of engaging in such an activity are clearly fruitful however there appears to be an overriding assumption that some sort of double crewing of

personnel will lead to the transmission of knowledge. What is not offered is an explanation of how the practitioner practises or indeed how they learn and develop their skill. Unless there is a serious understanding of how crime scene practitioners practise their craft then efforts to develop it potentially have little foundation. Moreover if the highly skilled practitioner is so fluent in their work, then it needs to be appreciated that to transmit these skills to another will involve tacit knowledge, within the automated process (Santilla, Korpela and Häkkänen, 2004). Reasons for 'doing' may not be explicit. Furthermore retrospective accounts also have the potential to offer little value if unstructured.

Nisbett and Wilson (1977) reiterate the words of Polanyi (1966) in their paper titled: "*Telling More Than We Can Know: Verbal Reports on Mental Processes*". Here it is argued introspection is not always valid, it can be thought of as a construction with different meanings presented. Davids (2000) places caution in using retrospective reports and calls for more research in this area specifically in the topic of deliberate practice. The reasons put forward are that the events are not remembered with absolute clarity. Lyle (2003) also raises the concern about retrospective reports by citing Hoffman (1995) in that they can be inefficient in "*knowledge elicitation*" but useful in particular domains where communication is part of the practice. Lyle does state that where activity involves observation and a verbal account, then retrospective reports can be used in specific circumstances for example using video stimulated recall. Here we begin to see how tacit knowledge might be captured, but it is not an easy process.

This automation (or tacit knowledge) as Baumard (1999, p. 64) explains is also problematic to analyse. It is evidently necessary to explore alternative methodologies that concentrate on the observation of investigator practice, to capture performance as it occurs rather than on forensic products. Once this is established then this methodology can be applied to those that have been identified as good performers, this is the main thrust of this thesis and indeed the framework for question four.

Dean, Filstad and Gottschalk (2008), Gottschalk (2008) and Holgersson and Gottschalk (2008) have made headway on the problem of observation in policing; their research describes police officers as *knowledge workers*, carrying out a range of investigations. They explain that both explicit and tacit knowledge is critical to solving investigations. The term police officers should be expanded to include Crime Scene Examiners as mention in the paper is given to the crime scene assessment process, (in addition Crime Scene Examiners are serving Police Officers in other countries.)

Baber (2006) does begin to open up the workings of an investigator's practice by using observational frameworks (based on Wright, 2000) to examine the cognition and use of resources in Crime Scene Examination. Here the environment and objects dictate *resources for action*. The principal stimulus of Baber's work was to develop technology that can free up the examiner to 'examine', make sense of the environment, gather intelligence without the constant stop start of either recording or documenting (Baber *et al.* 2009).

Research activity has also focused on differences in searching strategies between expert and novice CSIs (Baber and Butler, 2012), of simulated scenes. The results have a significant impact for practitioners and trainers in that situation awareness seems to play a considerable part in the visual examination. To paraphrase Lesgold *et al.* (1988, p. 311-318) *experts do not see more they just see differently*. Lesgold's work compared student and expert Radiologists. Each participant was required to view (and think aloud) x-rays that depicted a number of features. The results are both qualitative and quantitative and support the notion of experts using schemas, first general before being fine-tuned with experts being "flexibly opportunistic, neither too fixated nor uncontrollably labile." In addition it is an excellent early example of verbal accounts (protocols) being used as data to uncover decision making.

In Baber and Butler (2012) experts afforded more attention to strategy building, comments resemble that of Lesgold *et al.* in that revision and reflection are common place. Lesgold *et al.* places some of these comments



under the labels of 'trying to get a schema, experiments with schema,' which parallels Schön's reflection in action (1983, 1987).

These are important points to discuss as they offer a window into how expertise is achieved, moreover these points begin to hint at professional knowledge or at least at cognitive tools used by expert examiners.

Labelling crime scene practitioners as non-experts or 'presenting only factual evidence' is an inaccurate representation and does not fully appreciate the complexity of the term 'professional knowledge'. Recognising the cognitive elements of the role and coupling this with theory sheds light on what areas are potentially being overlooked and begins to construct themes on how practitioners should be shaped. By viewing the crime scene role from a particular ontological position that does not recognise opinion based work, clearly is not going to provide opportunities to develop this tacit element of the role.

This is not without difficulty however, since Fingerprint Experts also work towards a Foundation Degree, and ultimately at the end of the required training and education are labelled 'experts'. This to some extent appears to have been challenged or at least regarded with less importance for one force. In 2010 the Metropolitan Police created an expert route for their Forensic Practitioners (Manson, personal communication, electronic mail 18<sup>th</sup> March 2014). Again the terminology is interesting and suggests a move towards commonality between scientific support staff roles.

The Discussion chapter of this thesis explores this point further and argues that all processes of Crime Scene Investigation have elements of interpretation and that perhaps identity and culture subdue or lessen the ability of this aspect of investigator practice to be truly overt. Nevertheless the title of Expert Route is interesting to appreciate, although it is not yet known if greater openness to opinion based evidence will be presented from these practitioners.

### 1.3 Assessing top performance in crime scene examination: Project Radisson a case study by Greater Manchester Police.

There has not yet been a surge in qualitative crime scene research from the stand point of establishing why some practitioners are high performing and others less so. The following literature is an internally published Greater Manchester police document that attempted to explore that question. Capturing the skills of practitioners is a necessary endeavour in an organised industry for a number of different reasons: It ensures the organisation maintains its capability, quality and identifies skills that need to be cascaded among other members in the workforce. It also opens up other possibilities where inspection can identify different approaches.

Greater Manchester Police launched their Project Radisson High Performers' Workshop with an aim to identify methods of best practice by the best performing Crime Scene Examiners, with a view to pass on those skills to other members in the department (Kelly, n.d. p. 41). Ten participants were selected based upon their "*consistently high performance in this field (crime scene examination) over a prolonged period.*" It should be pointed out that these members were not only selected due to their high fingerprint and DNA identification products, indeed it was also the ratio of identifications to the number of scenes examined and the number of samples submitted. This controlled for practitioners that have high identification rates, who also submit a large volume of material which did not generate identifications.

The main aim of Project Radisson was to produce guidelines based upon the knowledge and experience of the participants. It succeeded in this; however the final conclusion does expose the realities of eliciting expertise in any research endeavour.

*"Anyone reading this document who is expecting to find the "magic bullet" to catapult their performance into the league of the ten individuals here may well be disappointed."*

Kelly (n.d.) is clear in the project that the skills developed by the practitioners can be taught to others and that the main area where these participants excelled was in *communication* and their *commitment*. This is interesting in

so much as that one of the research questions posed By Kelly at the beginning was to examine if the participants had any natural talent in the field of Crime Scene Examination. This is not commented upon further in the report; instead a focus group approach was used to elicit information from the participants. It should be established that members of the Radisson group were not directly observed, merely interviewed. Although their comments are useful, there are no firm assurances that the individuals implemented their comments and that this was the reason for their high performance. Furthermore since experts know more than they can tell it is reasonable to argue that interviews alone as an approach would not elicit expertise or show performance above their peers. The Radisson document is clearly filled with many useful tips and good practice approaches to crime scene examination, however much of the material is still largely tacit (p. 13).

*“The group emphasised the need to spend a reasonable time making a visual appraisal of the scene before commencing the examination.”*

This is sensible advice and there are useful comments to assist an examiner in their searching. However it does not nor could the methodology adopted be expected to cover how participants make sense of their environment (p. 15).

*“Brush strokes should be light and even.”*

What is meant as a reasonable amount of time or indeed the exact nature of ‘light and even’ is not clear. The exact meaning of these statements is held by the expert and not easily conveyed. Viewers need to see for themselves and assimilate this new knowledge with their own experience for it to make sense. It should be emphasised that the booklet provides many interesting techniques for other practitioners to adopt and a glimpse at what it means to be an expert examiner. These are highly useful and in some instances it provided a window to the working environment of the practitioner: (p. 15)

*“All officers opted for replacement of old brushes rather than their cleaning. The use of detergents on natural squirrel hair has the effect of removing natural oils thus leaving the brush feeling “dry” and prone to leaving powder scratches or damaging marks.”*

Kelly is honest in that this project is a first step and clear guidelines have been presented for future working practices; however the cognitive and physical processes involved are unknown. There are still questions relating to how an examiner perceives an object to be important or the strategies involved to recover evidence or intelligence. When these and other actions occur and when others do not, along with exemplars.

It is suggested a more involved approach using an observation framework to elicit expertise and expert performance is needed. Kelly (n.d. p. 42) does suggest that performance produced by those in the Radisson group, comes from commitment and enthusiasm. This arguably does suggest that Kelly acknowledges that natural talent is not a factor especially as all the comments presented seemed sensible and to be found in crime scene training manuals.

The perspective or standpoint of what defines a top performer warrants exploration and explanation. These terms refer to those that scored highly in the recovery of forensic trace evidence notably fingerprint and DNA exhibits. Moreover this definition is fluid and not fixed, in that its reference is in relation to acquisition crime. To expand such definitions to include major crime would be misleading. Whilst not overt this same understanding is presented by Adderley and Bond (2007) in their aim to identify top performing Crime Scene Examiners through the use of neural network software. The references contained in their work are clearly at the volume crime level. Further to this there seems to be a divergence, with new research now focusing on what makes up a good performing examiner (Kelty and Julian, 2010; Kelty, Julian and Robertson, 2011).

#### 1.4 What is knowledge and how can it be linked to understanding Crime Scene Investigator practice?

The term informal learning by Cianciolo *et al.* (2006, p. 623) discusses the creation of opportunities for expertise to be shared. These informal learning opportunities have also been examined by Lundin and Nulde'n (2007) in *Talking about tools – investigating learning at work in police practice*. Lundin and Nulde'n make specific mention to tools used in police work moreover their focus was on work that was “mundane”, in essence everyday working activities. Here it was recognised that expertise develops through engaging in conversations about ‘tools’, where tools can be any object used in day to day activities, for example: computer equipment, a police vehicle, radio communications etc. Similar examples can be mapped over for Crime Scene Examiners, notably fingerprints brushes and powders, lifting techniques of latent or enhanced marks using a variety of associated equipment such as gel scanning technology. This method of learning is critical to appreciate as it assists in understanding where and how professional knowledge is created. This is evidence of work and learning theories having a valued part to play in understanding the work of the Crime Scene Examiner and justifies the third research question.

*“Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?”*

The role in making a difference in development lies in what assistance can be given to the student or practitioner; this is discussed later however its mention here is necessary to reinforce how learning and development is a social experience. Brown and Duguid (1998) flesh out the importance of learning in a given situation or space, they argue these will be different experiences depending on if the condition is simulated or real. For example the comparison between an educational or training setting to that offered by the real world experience of being at a crime scene. It is important therefore to think critically when learning takes place and the location it occurred in, moreover it is apparent even at this juncture that qualitative inquiry is

necessary to capture these examples and any methodology needs to explore real world investigator practice.

Baumard (1999 p. 64) recounts Greek philosophy in that practical knowledge and social practice were sought after and worthy of endeavour. It was through social interaction, observing the practice of others and practice for its own sake that education and learning in particular phronesis (experiential) knowledge, was acquired. This kind of knowledge is personal and according to Baumard, difficult to analyse and more problematic to test. This also suggests that it is difficult to elicit even before the analysis can begin; nevertheless it opens up the kind of knowledge that requires observation. Phronesis knowledge relates to experiences and the knowledge obtained from these events. Interestingly the concept of practice is linked to Ericsson's (2004) *deliberate practice* theory, whereby practice for the sake of practice is insufficient to develop expertise or gain useful knowledge. Instead it must be accompanied with feedback and that practice needs to be highly specific. Moulart *et al.* (2004) found that high achieving medical students engaged with deliberate practice more than low achieving students, an indication that natural talent is over played, a point picked upon further in this thesis. If expertise is difficult to elicit then methodologies need to be innovative to capture it. These were fundamental areas for research questions three and four to address.

The mechanics of the tasks performed by forensic examiners is clearly only one facet that requires development. How learning occurs from experiences needs careful exploration and analysis as does the combination of activities that occur during the examination process. This needs to sit alongside how practitioners are measured and questions asked as to whether performance indicators capture the entire role of the Crime Scene Examiner.

### 1.4.1 Is factual evidence the same as 'truth' in Crime Scene Investigation?

To accept the appearance of tasks as purely mechanistic and individual from other tasks or activities is perhaps naive. What is needed is a methodology that not only captures investigators practice as it occurs, but also allows deeper understanding of that practice. The focus or concentration should then be on what influences actions, decisions and the learning generated. Nikolou-Walker (2007) make reference to Kuraitis (1981) and whilst this reference is some three decades old the point is poignant as the coalition government deliver austerity measures upon the public sector, more specifically the police budget. Kuraitis suggests that whilst the perception of training may be valued, it is nevertheless one of the first areas "to face the axe". Nikolou-Walker (2007) argue that training is about maintaining "capability" and as such its standpoint is about equipping people with core skills and if training provided significant value one would be concerned to reduce this input in times of austerity. Furthermore how individuals are measured and whether this is connected with working practices is necessary to acknowledge in times of austerity. Training is perhaps reactive, rather than equipping individuals with problem solving skills to deal with new situations. The most controversial issue raised by Nikolou-Walker (2007) is that National Occupational Standards are a concern for Educationists. Nikolou-Walker (2007) argue, that these standards detail behaviour that needs to be performed. Students know what is required, and can either pass or fail the competence outlined in the Elements and Units. It is difficult to measure these standards and it is entirely possible that standards become a minimum amount. Moreover the framework is rigid perhaps too rigid in that it fails to explore or encourage innovation or real learning. The investment in critical thinking is necessary and as Nilolou-Walker puts it:

*"Critical thinking is about continuously making sense and meaning out of our experiences."*

This evidently concerns hypothesis testing in crime scene examination as well as dealing with the aspect of knowing where and how to begin the

examination process. Critical thinking as a product evidently needs to be understood and captured. Moreover real world examples need to be obtained in order to demonstrate professional knowledge. Practitioners need a point of past reference, an exemplar or a model on which to base a working solution. Without this the need to acquire a strategy relies on making sense of what has been presented, searching for new and additional data before the problem no longer causes a concern. How to capture practice to assist in presenting evidence for a standard is clearly a sub-question to the fourth research question:

*“Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?”*

Dewey (1910, p. 8-9) considers the point of past experiences and what is meant by ‘belief’ and ‘knowing’ with facts or as Dewey describes them, “*assurances*”. These are not the same as beliefs in that they should not be afforded with the same credence or value. *Thinking so* and *believing* are graded equally and may be regarded as a stage prior or subservient to, *knowing so*. This parallels Dewey’s analogy with rain: seeing rain is one thing and sound claims can be made to this with observable confirmation. This is somewhat different to deriving the same claims based on environmental cues. The triangulation of beliefs is often more than sufficient to arrive at a conclusion but beliefs in themselves are inferential and accompanied with supposition. Unless the Crime Scene Examiner visibly saw the offender enter the property or vehicle or engage in some other illegal act then conclusions presented are beliefs supported by where possible accompanying interpretations. Grinnell (2000) cleverly describes this in his use of a baseball analogy. Here three umpires take one of the following possible standpoints in deciding whether a ball was out of play:

*“I call balls and strikes as they are. The second says: I call them as I see them. And the third says: What I call them is what they become.”*



The situations are all the same, the events have not changed but the beliefs or as Grinnell describes, the attitudes that the umpires bring to their practice is clearly different.

*"The first type claims truth; the second, perspective; and the third, power."*

The possible reference for a Crime Scene Examiner interpreting the point of entry used by an offender is apparent and arguably the *truth* is perhaps fluid or at least interpretation based. Furthermore at what point does this become fact? These questions do not necessarily confine themselves to the point of entry but go beyond and encompasses other observational material. For example whether a lock was forced or fabric marks interpreted as glove marks. If we accept that attitudes are brought to work, then, these attitudes have the potential to govern how a crime scene is processed; where evidence is collected from and indeed what constitutes evidence and intelligence.

It is argued therefore that Crime Scene Investigators present opinion based evidence but this evidence is wrongly labelled as factual material and afforded the same authority as truth. We can begin to see that it is necessary to explore how the investigator processes the scene, to learn and understand the decisions they make rather than rely on the frequency of forensic products if we are to learn more about expertise development.

Competence as defined by the Qualifications and Curriculum Development Agency:

*"the ability to perform to the standard required in employment across a range of circumstances and to meet changing needs" (QCA).*

It is now prudent to discuss the National Occupational Standards (NOS) by Skills for Justice for Crime Scene Investigators. These define good practice, in the way practitioners carry out tasks, based on the functions of their role. They can be regarded as quality standards for people.

*"They focus on outcomes - what needs to be done, not how you should do it."*

(National Council for Voluntary Organisations, 2012)

On this point National Occupational Standards and observing how they are tracked has been a subject of study in Social Work (Vitali, 2011). Vitali also recognises that competency based educational programme have been apparent in a wide variety of domains.

What is also confusing is that alternative standards are also in existence for CSIs, for example the European Networks Forensic Science Institutions (ENFSI) Standing Committee for quality and competence (QCC) (2004). It was through a Memorandum of Understanding between the European co-operation for Accreditation (EA) and the European Network of Forensic Science Institutes (ENFSI) in June 2006 who decided that the international quality standard for inspecting bodies would use ISO/IEC 17020:1998 to accredit Crime Scene Investigation standards. ENFSI have broad objectives that are linked to this, notably promoting the exchange of information and expertise, developing professional standards, 'harmonising methods used at crime scenes', producing good practice manuals for scene examiners (ENFSI, 2005)

ENFSI are clear that standards inform what practitioners should be able to do not how this work should be done. In 2008 in their *Guidance on the production of best practice*, they produced the following definitions:

**“Competence** - a person’s qualification for the job by virtue of their training and/or experience and demonstrated knowledge, skills and abilities.

**Competence Assessment**- a formal assessment to check whether or not an individual meets the standards of performance”

It is here that the standards are stated as being aligned with ISO 17020, “specifically: *“The role of the crime scene investigator will focus around activities B to D and might include parts of activity I.”* (Guidance is provided by EA-5/03) These standards stated as: *‘Performance based standards for forensic science practitioners’* can be used to assess competence. Although there will be some elements of Activity A (Undertake initial actions at the scene of incident), most of the work is centred on the following:

**Table 1.1 Selection of ENSFI CSI standards**

<b>Activity B:</b>	<b><i>Develop a scene investigation strategy</i></b>
Standard B1:	Determine the requirements of the investigation
Standard B2:	Make assessment of the scene and determine requirements
<b>Activity C:</b>	<b><i>Undertake scene investigation</i></b>
Standard C1:	Establish and preserve control of the scene
Standard C2:	Prepare to examine the scene
Standard C3:	Examine the scene
Standard C4:	Collect potential evidence material
Standard C5:	Pack items and samples
<b>Activity D:</b>	<b><i>Interpret scene findings and order further examination</i></b>
Standard D1:	Analyse the likely sequence of events
Standard D2:	Decide on which items and samples are to be examined further
Standard D3:	Transfer the items to the designated locations
<b>Activity I:</b>	<b><i>Report findings</i></b>
Standard I1:	Produce report
Standard I2:	Participate in consultation before trial.
Standard I3:	Present oral evidence to courts and inquiries

The above standards are broken down further and are very detailed in the activity required, in essence a checklist. For example specifying that the packaging material should be prepared, or control of the scene should be established. They do not operate at the micro level informing the examiner which techniques to use. This would involve the 'how' or professional knowledge and a step away from *what* needs to be performed. The guidance notes only include what should be included in an operations manual. There is much reference to supporting development of expertise in these documents, indeed this is a key objective of ENSFI. However no documentation is presented that covers how knowledge is transmitted in the workplace or

where these learning opportunities can occur, in order for practitioners to deal with the activities listed. A strong element of where practitioners are on the scale of expertise is lacking, since each scene has varying levels of complexity. Consequently Activity Standard D2 *decide on which items and samples are to be examined*, will be different for an indoor burglary crime scene (where information is more likely to be present) to an outside crime scene where the examiner has to assess the value and relevance of potential evidence from street debris.

Furness and Gilligan (2004) express concern with being able to implement the assessment of the National Occupational Standards in their domain of social work:

*“The GSCC (General Social Care Council) will not be providing guidance on the interpretation of these standards in terms of levels or indicators of achievement. However, the GSCC will have a responsibility for the regulation of programmes. It would, arguably, be more helpful if the DOH were to produce national guidance to ensure that consistent standards are applied across the country.”*

Concerns are raised as to whether standards across the board will be uniform, along with what they should look like. This is equally critical for crime scene investigation work. Rolls (1997) scopes out the history of National Occupational Standards, charting policy to the mid 1980's. More than this, Rolls positions how these standards relate to practice within the field of health care and how academic assessment fits with these standards. The concerns and questions raised by Rolls relate to many dynamic occupations however the most interesting is the role of the reflective practitioner.

Rolls spells out some of the skills needed.

*“work at a high level of complexity drawing on a wide knowledge base and using an extensive repertoire of interpersonal skills. More specifically it requires having the ability to make decisions based on competing demands...”*

Rolls argues that National Occupational Standards face a struggle to create a standard that properly resembles the complexity of work occurring, specifically, *reflexivity* and *responsiveness*. The debate presented asks some fundamental questions in how competence:

- may be recognised
- when it is viewed,
- at what point is it reached or a satisfactory approach obtained.

This work was written over a decade and a half ago and the presentation of reflective material in this domain is now flourishing. The above concerns are transferable to Crime Scene Investigator practice with an additional factor of discourse in *crime scene examination reflective practice* being somewhat barren.

Skills for Justice National Occupational Standard CN 101 Develop a forensic strategy for forensic investigations clearly states that this is more likely to be simpler for volume crime, in this one unit there are two elements. Element 1 has thirteen performance criteria and Element 2 has 11 statements under this unit and to meet the standard there are fifteen statements under the title *Knowledge and Understanding*. Four of these are legal points capturing requirements and responsibilities of the law and policies. The proceeding ten relate to the forensic strategy itself and the last one is a health and safety comment.

The standard is not user friendly and there is no way the user can determine whether they are meeting the standard unless they engage with a trainer or similar. Moreover the structure of the standards are abstract, leaving much interpretation such as:

**Table 1.2 Structure and language: A analysis of a selection of Skills for Justice NOS CN 101 Develop Forensic Strategy for investigations.**

<b>National Occupational Standard</b>	<b>Reflection and analysis of the standard statements.</b>
Gather all available information...	It is not clear where or how this should be achieved or even where this information may be found.
Assess correctly...	It is not explained what correctly should look like on that that the assessment of the scene should be done correctly. It does not cover what or where or how to assess.
Consider the possibilities...take the correct action.	Decision making and judgement is at the heart of this standard and it suggests that the correct action is a singular event that will be uncluttered and distinctly apparent.
Determine the investigation needs...	This is a broad standard, examining priorities and who to contact. How these needs would manifest themselves is not discussed or even examples provided.
Identify and prioritise forensic objectives...	The term objectives is not explained, the remainder of the standard is therefore immaterial furthermore there is nothing in this standard to assist in identifying what one is.
Determine whether there is any indication of the offender having forensic awareness...	The definition if forensic awareness is not defined, for example is wearing gloves sufficient to state the offender is forensically aware, or are more sophisticated methods needed, such as the removed of shoes prior to entering the property?
Ensure that forensic objectives allow for the appropriate sequential examination...	What a sequential examination looks like and when it should be applied to beginners is simple and discussed in this thesis. There are times however when the sequence of visual, photography, forensic, fingerprints is not the best course of action.
Consider the possible outcomes from a range of relevant examinations...	It is argued that this is fluid, dynamic in nature and would require the examiner to have awareness of all the outcomes; what is relevant in the context of the investigation is arbitrary.
Brief the investigation team correctly, where relevant.	What the investigation team need to know, how it should be packaged or even in what media format is not debated, that is in person or via written communication in the form of a handover report.

We can see the terms in the forensic strategy are general but over all they are steering towards a vision of what is required, rather than a micro analysis of the decisions that occur in the moment of a crime scene examination. Other units for example CN 703 Examine forensic items, these are also phrased using similar language, an analysis of all the standards does not provide an insight into how the work is actually portrayed since examples are not provided. Standards are also open to interpretation with the reader having their own perspective on what is correct, or where proper judgement has been made. In their current form it is hard to see how they can be used to drive up performance and be properly integrated into competency testing. What is needed first is a method to better understand the forensic practitioner, to expose the true nature of the work and where possible provide examples of what existing standards might look like.

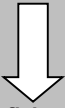
So far National Occupational Standards have been argued as not seeing the complete picture to how expertise is developed. Their goal of developing expertise is through procedures rather than an understanding of how practitioners learn from experiences or colleagues. The answers to how practitioners learn or develop will not be found in the literature on the subject since the drive has been to concentrate predominantly on the number of forensic products recovered, in addition cited authors in this area are few in number. An alternative approach is necessary: here the third research question proposes an exploration of how theory of expertise development can assist in the understanding of practitioner practice. This provides a window for learning how to observe the domain and the value of grounded theory tools in developing this understanding (Health and Cowley, 2004). The removal of practice standards is not proposed, the argument is to simply provide examples of context, a clearer picture of practitioner practice. First however it is necessary to understand the different stages of practitioner development. To know and recognise the capabilities of the practitioner along with the supporting expertise theories that assist in helping us to observe and make sense of their work.

## 1.5 Expertise theory defined and the incremental stages of development: An approach to understanding practitioner performance.

Table 1.3 showing mapping across 3 proficiency scales

Chi's (2006) proficiency model adapted from Hoffman (1998)		Scott and Sewchurran (2008)	Cicmil (2006) maps experience and actions against Dreyfus's (2004) 5 stage model of adult learning development.		
<b>Naive</b>	Those classified as Naive may be regarded as being totally ignorant of the chosen domain, no previous association or awareness of what the domain holds.	<b>Unconsciously incompetent</b>	No clear definition for those with no connection or knowledge about the domain.		
<b>Novice</b>	Novices are those that are new, deemed within a probationary period, exposure as Chi states is minimal but nevertheless it can be assumed that awareness is certainly present.		<b>Consciously incompetent</b>	<b>Novice</b>	Learning is fact based, with association with rules that govern actions within the situation. Evaluations review the usefulness or valued added of the rules implemented.
<b>Initiate</b>	Initiate builds on this awareness, exposure may include some kind of initiation or introduction.			<b>Advanced beginner</b>	Previous experiences demonstrate a history, through this history patterns begin to emerge. Reflection is limited nevertheless learning is apparent from this experience but implemented actions are still "trial and error".
<b>Apprentice</b>	"literally one who is learning", the development is usually formalised in some way with the student being immersed in some capacity, although it is recognised in some domains where danger is a serious risk environments may be simulated	<b>Consciously competent</b>			



<b>Journeyman</b>	This is in essence represents a high level of proficiency, Chi describes this as someone who can work for a period of a day with little or no supervision. Nevertheless at some juncture instruction or assistance is necessary.	<b>Unconsciously competent</b>	<b>Competent performer</b>   <b>Proficient performer</b>	Practitioner learns from own experiences and from others, with this comes a level of awareness in knowing what is important, establishing an order to the events. "Prioritise elements of the situation". This leads to the establishment of a "goal and a plan". Mention is made in being able to "think on one's own feet", suggesting confidence, there is still insecurity, deliberation in terms of the "consequences of using one's own judgement".  Decision making is key; this unfolds from the "awareness of interpretation and judgement" with less reliance on rules. Situation requires "understanding...on the basis of prior actions and experiences" Appreciate that understanding is not simply actions following a rule based logic, but is reflective.
<b>Expert</b>	Experts are highly regarded by their peers, approval may be related to a particular level acquired within an organisation or be viewed as someone who possesses skills and consequently a much valued resource.		<b>Expert or virtuoso</b>	Intuition and reflection are elements that are pivotal in practice. "Synchronous understanding of the situation", reflection and action ebb and flow, practitioner is not encumbered by anomalies.  "Reflective learning stimulated thinking and doing", "...understanding of the situation..." A deep intuition is apparent, "knowledge and action are inseparable..."
<b>Master</b>	The Master may not necessary show any more brilliance than an expert however other experts may view one in particular who has a specialist knowledge that is scarce. This definition also includes those that are deemed respected and suitable to teach those at a lesser proficiency scale.			

The mapping of different expertise levels in the table above shows where different thinking is aligned and whilst opinions differ in relation to the number of steps it is noteworthy to comment on the spiral perspective suggested by Johns (2009). Tabulated or segments of individual proficiency does not occur in a uniform manner, practitioner development comprises of a number of different skills sets and not all will develop in a congruent fashion. Instead it is perhaps better to think of development as a sine wave with proficiency

oscillating until practice becomes stable and competent performance is repeatable.

First, situation awareness governs what actions are implemented (Endsley, 2006). Understanding the environment and indeed the problem is paramount; these appear to increase as the practitioner moves through the different levels. A move from rule based applications to intuition is evident. Situations are in themselves experiences and it is through these experiences that sense is made with a library of similar situations providing a catalogue affording confidence in decisions and strategies. Chi (2006) echoes this with experts and novices in the domain of physics. Their findings showed novices to be geared around the application of rules, experts however spent much longer understanding the problem with much less focus on the application of known processes. This may appear to contradict earlier statements whereby solutions are found in one's own experience library, in itself a logical rule based approach, however as Schön (1983) points out, not all problems can be solved in this manner. Carter *et al.* (1987) compared protocols between students, expert and novice teachers and business experts who had a desire to teach but had no "pedagogical training." Carter *et al.* found that expert maths teachers perform their decision making tasks in much the same way as experts in other domains.

Table 1.3 also highlights the value of reflection in particular by experts or virtuosos. Reflection encompasses evaluation through critical thinking, it steers decision making and is a necessary skill to progress through the different proficiency levels. Fook (1997, 2002) picks up on what expertise is about in her study of Social Workers. This domain has overlaps with crime scene investigation principles in that field examinations are required and legal considerations, welfare and engagement with the public are core duties. Furthermore the research activity commented upon by Fook also resonate with crime scene investigation:

*“Of major concern in social work is the need to generate theory which is of relevance to the practitioner (Saleebey, 1993). As well, there are increasing calls for empirical research which studies the ways in which practitioners use knowledge in action (Kondrat, 1992) and the particular processes involved (Nurius and Gibson, 1990).”*

### **1.5.1 Becoming an expert**

Interestingly Fuller and Unwin (2004) challenge the description or route to becoming an expert, they argue that experience is different to years served. Duncan, Williams and Brown, (1991) when examining drivers concur that experts' status is not automatic over a given temporal frame or related to general experience. McDaniel, Schmidt and Hunter, (1988) also concluded that there was only a moderate correlation with job performance and years served after the first two years of service.

The term *experience* is perhaps misleading and as explained by Benner (1984) in the field of nursing and later by Rolfe (1997) clarifying Benner: experience, is more than the *'passage of time.'* Instead it relates to what has occurred that has involved emotions and changes in action. This thesis argues that these aspects of Crime Scene Investigator practice require immediate exploration with findings having the potential to offer equal value to the recording of forensic product hits.

The requirements of being an expert are complex with many practitioners reaching and remaining at the level of *'journey man'*. It is suggested that perhaps the term *'expert'* is overused in the literature to cover a certain level of competency or ability to work with many unknowns. Fuller and Unwin (2004) do provide an insight into different ontological positions for 'whom' or 'what' is an expert with these positions being dependent on the organisation and the role played within that setting. Novices may indeed reach expert status quickly if perhaps their role is restricted to one specific area of practice. Whilst their ascent is rapid it is nevertheless restricted or *'bounded'*. This is necessary to acknowledge since Volume Crime Scene Investigators are bounded in much the same way. That is to say their working practices and attendance criteria are constricted by protocol; consequently this allows

a rapid growth to becoming an expert. Although as Fuller and Unwin (2004) illustrate:

*“albeit to a very narrow and bounded interpretation of what constitutes an expert.”*

Furthermore Armstrong and Mahmud, (2008) reiterate the value and methodology in testing tacit knowledge. They found in their study of managers that tacit knowledge was independent of general work experience but instead related to their specific role in a managerial capacity. Wyatt (2003) also comments on the elusive nature of tacit knowledge:

*“which serves to hamper research”,*

Nevertheless an ethnographic approach by Wyatt was rewarded with a deeper understanding of the work and judgement implemented by paramedics. The role of experience and learning within a specific context was just two of the themes identified.

This thesis also illustrates the rich theory in the field of tacit knowledge and expertise in that its underpinnings are based on the works of Polanyi (1966), McAdam, Mason and McCrory (2007), Baumard (1999) and others. Expanding this concept out provides further evidence for the value of obtaining, managing and cascading tacit knowledge as well as recognising those actions, decisions or procedures that stifle it. The focus on tacit knowledge reflection from experience is expressed by Matthew and Sternberg (2009) as warranting further work. They acknowledge the challenges of those in Higher Education and professional development and that there is a strong need to get professionals to learn quickly and more effectively. Their work specifically targets tacit knowledge acquisition.

On this topic Vygotsky and Cole (1978, p. 90) explain the work of Piaget:

*“communication produces the need for checking and confirming thoughts, a process that is characteristic of adult thought”*

The role of reflection is evidently powerful. Vygotsky and Cole explain how it is used to make sense of rules when interactions have occurred between people and the environment in which these interactions have taken place.

Learning takes place from this process and that learning brings about or stimulates “*internal development processes*”. This occurs because of the interaction between peers and equally the environment in which these exchanges and experiences take place. This facet to learning was not reported by Kelly (n.d.) in the Project Radisson report. It was not expressed if the Radisson group learnt or afford time to reflection and observation of others, instead it focused on what the participants said they did.

Langford (2005, p. 133) offers a simple and arguably more contemporary interpretation of Vygotsky’s Zone of Proximal Development model and provides a clear explanation of its use as a measure of performance. Students are given work that is slightly above their level of development, the space or zone between completing the task independently and with assistance is indexed and forms a measure. The key factor is the ability of the learner to move forward with assistance. This provides a better measure of development as two learners potentially could be at the same level when independently working on a task but be remarkably different when assistance is provided.

Here Hodapp, Goldfield and Boyatzis (1984) explore Bruner’s scaffolding concept, this is presented as a social ‘*scaffold*’ on which development can continue. Englert, Berry and Dunsmore (2001) provide an interesting perspective of ‘scaffolding’. They posit that learning is a social practice and novices can engage in that practice in whatever level they choose. The relationship between scaffolding, sharing awareness, tacit knowledge and being socialised into practice is clearly fundamental for a practitioner’s development. In addition to this Englert, Berry and Dunsmore suggest that the progression for a learner is accompanied with frequent involvement in these social interactions. Even more interesting is the reference to tools and language, which chimes with the *rising of competency* as commented by Lundin and Nulde´n (2007) when practitioners engage more in conversation about the tools used in practice.

Engeström (2004) also believes that learning takes place between people

and the occupied environment. It leads to knowledge and skill, and may not always have to be observed. Instead it is the shared construction of events or interpretations that leads to the construction of new knowledge. Exploring what VCSIs talk about and how this discourse is manifested is consequently important. It is possible that through examples, shared case histories or experiences that others can connect with, leads to better understanding. Lave and Wenger (1991; 2002), explore this relationship. Put simply when practitioners become more competent, they simultaneously appreciate the importance afforded to certain tools and procedures, thereby moving towards a more central part of the community of practice. Capturing this in a research methodology clearly is necessary. As previously stated tools do not have to be physical artefacts, language or jargon can be a tool as well as abstract concepts such as time. How these are used is important. Being able to complete a job within a time frame also assists in being more a part of the community of practice.

*"In conversations, workers engage in practice, and learn to become competent practitioners"*

Lave and Wenger (1991) introduce the process newcomers go through in terms of their knowledge in practice, in that it is sustained and distributed over time and this knowledge innovates the practice (Wenger, 1998).

Handley *et al.* (2006) discusses these points by suggesting that situation learning theory does not fully address that knowledge in the workplace is often tacit. This all occurs as participants develop an identity and that knowledge is socially constructed.

Interesting Holton and Clarke (2006) comment that when a learner is stuck this learner will often require the assistance of an expert or more advanced peer. This assistance should allow them to move to a path that assists them in finding a solution, however they raise the question:

*"What if there is no expert present?"*

The learner still needs assistance, moreover they need assistance to build their own scaffold and achieve their goal. The tool box for such instances lies

in knowing where answers are to be found and what other alternatives for examining practitioner practice exist that also offer a solution for developing practitioner expertise. This thesis will later explore the use of head-mounted camera technology as an opportunity for practitioners to see the same or similar problems faced by experts, allowing them to construct their own scaffold. It is through using this technology that the observer begins to see new meaning and understanding.

Liu (2006) provides further evidence that suggests competency standards may not always drive up expertise, Lui scopes out and presents reasons for how competency traps occur as an organisation moves to control and explore knowledge. A factor Bain (2009) has recognised in industry safety standards. One reason being for an organisation's persistence in using poor or less grade systems and procedures is simply because the results are favourable. This leads to much experience in dealing with these systems which in itself keep at bay more productive methods. An example is the need to produce quantitative results for Association of Chief Police Officer (ACPO) ranks and their use in comparing the performance of Scientific Support Units between police forces. It is unrealistic to remove this numerical metrics however on their own they focus principally on volume crime and critically do not inform managers about how an examiner practices only their recovery identification rate. Furthermore numerical metrics have no capacity to spread useful tacit knowledge between practitioners. M. Johns a Scientific Support Manager in a North East Police Service in conversation (2013, 1<sup>st</sup> July) stated that in her force forensic investigators have double crewed with higher performing officers in order to spread good practice. This suggests that a detailed examination of practitioner practice is necessary for all stakeholders.

A strategic question posed by this thesis is that if only positivistic methods are used to compare police forces and judge performance, then there is little point in pursuing new alternatives. Liu explains this as a balance, a balance between knowledge exploitation and knowledge exploration. Liu cites March (1991) in that the term 'competency' has wider meaning and can be said to incorporate methods and procedures and not simply those defined in

protocols. The approach is nevertheless still the same; the satisfaction with existing competencies may not drive the development of new ones. Furthermore if competency standards are not used in every day work to measure or calculate performance, then being productive in these has little incentive. Using knowledge that is already in existence has the potential to always be exploited with little attention in developing new models or ways of doing.

A review of the paper by March (1991) provides some examples of what makes up these labels.

*“Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution.”*

Crime Scene Investigator research therefore needs to explore labels such as *experimentation, play, flexibility, discovery, innovation* and their connection to reflection as well as expertise. This is somewhat different to the approach by Roux and Robertson (2009 p. 589), they advocate that Crime Scene Investigator training should be structured, with defined learning outcomes that are supported by a competency framework and a strong awareness of corporate values. If all of these conditions are met, then there will be *enhancement and development* of expertise.

This thesis does not argue that the above points are ill thought out, misguided or indeed wrong. These comments are sound and well worth the energy needed for their implementation. However on their own they do not unpack or recognise patterns of learning in the workplace, when this learning occurs, the experimentation that novices engage in, the transmission of tacit knowledge, communities of practice or the obstacles placed in the way of sharing awareness. Moreover there is no comment by Roux and Robertson to reflection and its link to practical intelligence, or robust strategic vision to uncover and make sense of practitioner practice. Nor are the tools for observation of investigator practice discussed and how this observation will be realised. Competency frameworks are abundant in crime scene literature



however no discussion exists on whether observing and assessing for competency will change that very practice and how this can be managed.

To rely on National Occupational Standards is unsafe, since these standards do not pick up the subtle nuances needed in every day work. These standards do not provide the skills for the examiner to be empathic, to share experiences they themselves have felt when they have been a victim of volume crime. The frustration, anguish and the decency afforded to those whom they are there to assist in a forensic and investigative capacity. National Occupational Standards are not designed to measure this, in which case it is right that alternative views are explored that capture investigator practice with a view to better understand it and provide clear recommendations to develop it.

The above point is commented upon from a technological perspective by Mennell, (2006), early on in this paper there is a push for education providers to identify the knowledge and skills for future Crime Scene Investigators. The mechanisms of how this approach can be implemented is not debated by Mennell, instead the paper offers a strategic vision, pushing for a better understanding of the role.

It is suggested that modern police business appears to be concerned with ensuring competency in crime scene examination with little attention on development of a strategy in how performance can be driven forward. Previous registration methods (Council for Registration of Forensic Practitioners) were deemed inappropriate and costly before being dismantled (Sommer 2011). Sommer also explains a valid point by quoting Pamplin the United Kingdom editor of expert witnesses and that little existed to assess whether CRFP improved performance furthermore such systems would not prevent miscarriages of justice and were less effective than professional bodies in its disciplinary powers.

The next section begins the move towards the Methodology chapter by exploring how expertise can be elicited, a step prior to the construction of any experimental approach.

## 1.6 Eliciting Expertise and performance, moving towards a methodology

Capturing crime scene practitioner practice has been argued in this thesis as being a key factor in ensuring a better understanding of this role, as well as alternative ways of measuring performance. These combine to offer different approaches to existing methods in identifying and developing performance. Difficulties lie in the elicitation of this dynamic occupation. The elicitation of expertise requires further investigation and scrutiny (Hoffman, *et al.*, 1995; Hoffman, 2008). Many excellent examples have been published to show differences between experts and novices however the definition of an expert is open to debate. Chi (2006) for example makes reference to experts and novices in physics however even in the experiment experts were still described as students (albeit doctoral level), The results discussed by Chi are nonetheless still valid however the broader interpretation of the claims should be regarded with less certainty. Hoffman and Lintern (2006, p. 206-208) discuss this very issue stating that less attention should be given to Chase and Simon's 10000 hours (of practice) rule of thumb to becoming an expert. Hoffman's (1998) proficiency scale (Table 1.3) instead allows research participants to be mapped against this spectrum. The question to explore is: *how can this be achieved?*

Hoffman and Lintern argue that *Social Interaction* is similar to 'Professional Standards', in this example managers and practitioners were asked who would be suitable for certain tasks. Individual names were commented as being the best option: "*If there was that kind of problem I'd go to Ted.*" (Hoffman and Lintern, 2006, p. 207).

It is therefore possible to grasp the kinds of skills needed in Volume Crime Scene Investigation through a proper analysis of the role profile. Role profiles define what characteristics, skills and qualities are needed for competent performance, moreover they signpost what expertise is 'essential' and 'desirable'. Classification of these will not only expose what employers believe is necessary but equally, highlight what is important.

The classification of the role profiles also help to make sense of practice. The Methodology chapter will present these classifications and suggest how they can be used to group activities which may be labelled holistically as work. The following section delves into Cognitive Task Analysis and provides an insight into understanding the theory behind the practical work presented in the Methodology Chapter.

### **1.6.1 Cognitive Task Analysis: Capturing knowledge and skill.**

The use of verbal protocol analysis has been found to be an effective approach to measuring differences between novices and experts with much literature in the domain of nursing (Hoffman, Aitken and Duffield, 2009).

Hoffman, Aitken and Duffield, (2009) make a clear point in that assessment of expertise between practitioners is best implemented away from simulated studies. Hoffman, Aitken and Duffield, (2009) stated that expert nurses were more proactive in collecting cues to assess a patient status than novice nurses. In essence a better understanding of nursing practitioner practice was established through this methodology.

Fox, Ericsson and Best (2011) examined 94 studies with findings based on 3500 participants. They commented that think aloud processes are not reactive moreover the effect size is "*indistinguishable from zero.*" That is to say it is non-reactive unlike other procedures notably describing or explaining thoughts. Think aloud verbalisations are therefore reported and believed to have no disruption on the sequence of thoughts; consequently their use to observe investigator practice is robust and realistic. In addition this approach is preferable to other methods such as post action interviews. It is not however a methodological research tool to record all thoughts. What is not captured is unknown and this must be acknowledged as a limitation. That said there are no better methods to record thoughts at the time of writing nor has a meta-analysis been carried out that surpasses that performed by Fox, Ericsson and Best (2011). Head camera and eye-tracking technology have

the advantage of going some lengths to triangulate data and offer an additional check on what is recorded to what is spoken out loud.

A key recommendation from this literature review is the exploration of 'think aloud' techniques when assessing Crime Scene Investigator practice, with less emphasis on post action interviews. Furthermore when assessing competency, and ascertaining if a practitioner has met specific standards: questions after the scene examination may not be as reliable as think aloud comments recorded at the time of the examination.

Daley (1999) provides interesting research that specifically does not focus on competencies or skills but instead what learning or strategies practitioners use. Novices according to Daley cite their emotional state, their feelings and the situations where these were expressed. Experts developed strategies that led to better solutions.

Knowledge and its management is critical in crime scene investigation work. The ability to recognise innovative practices or approaches is necessary along with understanding how practitioners function in their environment.

Busch (2006), Busch and Richards (2006) discuss innovation and its importance in business, more importantly they offer an alternative to identify tacit knowledge through the presentation of a tacit knowledge inventory that measures behaviour. They argue that participants will show key examples of innovation or "*thinking outside the box*" over time. Research that sees only opportunities to gather tacit knowledge from scenarios (albeit grounded in the real world) cannot realistically measure all areas of behaviour. It is proposed that only ethnographic studies that follow and explore the rich diversity of practice offer the deep understanding needed.

Moreover the analysis of practice can only be achieved through viewing the setting and to-date little has been done in making sense of Crime Scene Investigator practice and at no such time has research clustered activities that make up practice.

It has been presented that crime scene practice is highly complex and dynamic even at the volume crime scene level however there is even more to

the role that requires consideration. Carper (1978) presents a detailed account of *knowing* in nursing however it is White's (1995) critique that is more interesting as it unpacks the concept of socio-political knowing.

*"sociopolitical context of nursing as a practice profession, including both society's understanding of nursing and nursing's understanding of society and its politics".*

An aspect not ignored by Heath (1998b) is the need for nurses to understand 'context' and not just individuals. That is to say the reasons for how and why people need specific care.

White cites Chinn (1991) in this debate about what nursing needs, interestingly it is the context of practice, understanding what it really is and how future nurses need to respond to the political and social change. This strikes a chord with the comments from Mennell (2006) in deciding what kind of Crime Scene Investigators are needed for the future, this can only be fully answered by exploring what kind of knowledge is sought after now and what sort of skills are in demand.

The true practice of nursing needs understanding in order to build skills and knowledge that can deal with all the facets of nursing. The examples cited by Chinn relate to social deprecation and greater frequencies of diabetes and the role nursing needs to play. What is not discussed is the reverse of this proposal, in this case how Crime Scene Investigators learn about the changing nature of the domain landscape. How the events they witness are reflected in the political landscape. Do they indeed understand why specific crimes are occurring and the greater connections associated with this.

It is no coincidence that there has been a surge of papers and books on reflection in nursing nor is it that White cites the early work of Benner (1984) and the novice to expert route in nursing. Although challenged by Cash (1995) Benner's response (1996) set in place some frames. The content in this literature is not debated here except the depth of *activity* is recognised, bringing in the work of Polanyi (1966) where knowing is demonstrated, "*we know more than we can tell*". Benner brings in Polanyi's (1958) earlier work in relation to practices and actions. These may precede formal understanding,

where only advice and arguably tacit knowledge exist. It is through reflection that this awareness becomes more overt. In essence Benner is acknowledging the importance of these in nursing, with the same seriousness as frequency counts of patient wound infections post-operative surgery.

Lawson and Lorenz (1999) pull together a wealth of literature on the field of tacit knowledge however one particular theme is that tacit knowledge is linked to mastering of practice citing the work of Nonaka and Takeuchi (1995) and their four stage model of product development. Although business related the concept of tacit knowledge to develop new methods or products is necessary at the beginning before these methods are codified and made explicit.

Special knowledge is clearly understood and preserved by some, in some instances revered by others. Elicitation methods for this knowledge incorporate both quantitative and qualitative approaches. These methods have the capacity to identify experts either through document, statistical or interview analysis. However their ability to uncover the development of expertise or expertise itself is limited. Alternatively Cognitive Task Analysis (CTA) is regarded as a clear methodology to answering the above problem. Hoffman and Lintern (2006, p. 208-218) unpack this approach by acknowledging the two paradigms, the first being *instruction behaviour* driven, a human factor engineering approach to answering questions in relation to expertise, securing and preserving knowledge. The other recognising the role ethnographers and cognitive anthropologists play pursuing culture, technology and work place dynamics. Here work analysis is described as a branch of ergonomics, initially examining performance but now incorporating cognitive aspects to work.

To think of Cognitive Task Analysis (CTA) as purely related to mental methods of work and problem-solving does not fully appreciate this knowledge elicitation methodology. Furthermore Clancey (2001) openly supports qualitative ethnographic methods. The three areas under the umbrella of CTA as explored by Hoffman and Lintern are *Critical Decision*

*Method, Work Analysis and Concept Mapping.* These are different approaches to eliciting knowledge and the process of work.

Hoffman and Lintern suggest the use of coding makes greater sense of what is being observed. Here Klein's (1989) work is cited as an example. This technique involves verbal reports being broken up into a series of categories; specific transcribed sentences are allocated to one of these. This categorisation is a technique often posited by Ericsson (2006) as being a useful method to elicit knowledge and performance skills. Bainbridge and Sanderson (2005, p159-182) perhaps provide the easiest explanation of verbal protocol analysis told through their use of examples. The 'think aloud' method goes some way to capturing thought although it is pleasing to note that Bainbridge and Sanderson (2005, p. 171) are not naive to the subtle nuances that indicate thought but are never articulated in any narrative form:

*"...significant activity may be verbalisable, but it may be more effective, appropriate or conventional to communicate it through silence, pauses, tonality, or indirect speech..."*

Grounded Theorists are keen to enforce that coding must not be forced but instead be generated from the data, as the data is examined line by line codes describing behaviour or activity unfold before finally being reviewed. Each code is subsequently compared to the next. Charmaz (2006, p. 178) describes this as '*Constant Comparison*' and is highly useful in reducing the number of codes to a more manageable size by removing similar codes describing principally the same activity. The memos generated from the codes, form what may be defined as the front sheet or overarching rule, for that particular phenomena. Material for Grounded Theory analysis can be in different forms, for example: documents; interviews; visual media such as photographs/video, and field notes based on direct observation.

### **1.6.2 Head-mounted camera and eye tracking technology in capturing practitioner performance.**

Tools have been used in recent years to capture human performance in various roles and tasks. Williams, Davids and Williams (1999, pg.144) approach to using eye movement technology is highly interesting and transferable to other domains. Seagull and Xiao (2001) have shown that mobile eye-tracking technology can also be used to capture highly complex procedures, the example being a tracheal intubation in an operating theatre. Their conclusion went further by suggesting that eye-tracking technology using a mobile device situated in a small backpack (a more versatile alternative to a desk based device often used in marketing or web browsing research) was highly useful in knowledge elicitation in Cognitive Task Analysis.

Williams, Davids and Williams review the work of Omodei and McLennan (1994), in their findings it is suggested that eye-tracking data is more complete than a head-mounted camera, with a head camera offering only head positions, albeit from the wearers perspective. This argument is still valid in that the amount of data captured is considerable and pupil movement clearly provides illuminations to how the operator searches for cues in their environment. However the review needs to be placed in context.

Omodei and McLennan (1997) have used head-mounted cameras to study naturalistic decision making (Klein, 1997), in particular with fire-fighters, a domain where equipment can be easily damaged and certainly different from a controlled environment such as an operating theatre. In addition head-mounted camera devices are no longer backpack devices and can fit neatly within a pocket, clipped on a belt or strapped to an arm, many are even smaller than the average smartphone. Their ability to capture data may not be quite to the level of an eye-tracker nevertheless the practical use in field research is more appropriate. Components are also weather proof and do not require lengthy and complex calibrations. Although it is recognised that low cost eye-tracker options are being investigated (Dongheng, Babcock and Parkhurst, 2006), however it is still envisaged that fine airborne powder to



enhance fingermarks such as aluminium could still cause damage to the mirror situated under the eye that projects the infrared signal.

The use of the head-mounted camera has one additional element that connects with theory under the umbrella of decision making. Mussweiler and Posten (2012) provide a simple yet detailed explanation of comparative thinking using three case studies of their own as well as review the work of others. They report that *comparative thinking* assists in increasing certainty about decisions as well as increasing the efficiency in which they are made. The term in essence is applicable for 'judges' deciding on what object or item is better, or indeed what sense we make about others by comparing the traits we observe against our own. In the first instance judges may refer to a library of standards or indeed from past experiences. Through comparison, participants need not calculate but instead compare and implement (or decide). It is quickly realised that those new in service or those experiencing problems for the first time will struggle with comparative thinking. Markman and McMullen (2003) provide a more detailed understanding in relation to the *reflection* and *evaluation* modes occurring during this process. They state that reflection is experiential, it occurs when one has information about the decision on which to compare (referred to as a standard). Evaluation occurs when no such information is held, it is not known, there is no standard on which to view and compare. The intricacies put forward by Markman and McMullen are highly interesting as they explain these mental simulations through the use of models, and the struggle to do so when no such standard exists.

The connection with Volume Crime Scene Investigator practice is that should eye-tracker and head camera technology be regarded as useful, then they have the potential to create a library of carefully chosen head-mounted camera video recordings. These recordings could serve as that standard, or in part way towards that standard. Moreover they provide context, and how the examination should be implemented, giving Skills for Justice and ENSFI Occupational Standards greater relevance. Novices and apprentices could view crime scene examinations carried out by journeymen and experts.

These would serve as exemplars, a reference of practice and a repository for National Occupational Standards.

Kelty, Julian and Robertson (2011), approach the concept of developing standards via another route, instead they examine the psychological factors that make up the best Crime Scene Examiners, they propose that there are seven distinct skills sets or phenomena that govern expertise

*“knowledge, life experience, professionalism, approach to life, communication, cognitive abilities, and stress management”*

The above is an interesting paper with a methodology similar to that of Lundin and Nuldén (2007) *“talking about tools”* however despite the emergence of these categories phenomena of this type does not assist those that are new and developing to appreciate the tacit assumptions performed by professionals.

The European Co-operation for Accreditation guidance document for ISO17020 in Crime Scene Investigation states:

*“Having qualifications, training and experience does not guarantee practical competence in crime scene investigation or sound professional judgement.”*

In addition they argue that each member of staff needs to be assessed against a competency framework. It is here that research questions on the methodology to capture and analyse performance are useful and to be presented in the following chapters.

### **1.6.3 Conclusion**

This chapter explains the varying titles of the crime scene practitioner with section 1.2 scoping out the role of the CSI and VCSI as well as the boundaries and cultural conflicts present within the domain. Clearly there is much variation in titles across the United Kingdom. Boundaries in the role appear more complex and appear to be connected to crime type attendance policies in the case of Volume Crime Scene Investigators as well as the level of opinion routinely expressed in court by Crime Scene Investigators and VCSIs. Section 1.4 specifically challenged the limitation of opinion based

evidence and presents an argument that crime scene practitioners make interpretations about the scene, these subsequently guide the examination strategy, even if these interpretations and opinion forming thoughts are not always transparent in a statement or verbal evidence before the court. These limitations were compared alongside more traditional forms of expert witness such as the fingerprint expert and forensic scientist.

Separating out expertise development from the role of the expert witness allowed a proper strategy for the development of the crime scene practitioner. Literature has shown that the accumulation of tacit knowledge and how it is used and transmitted to others is the key to developing practical intelligence (Cianciolo, 2006). Moreover an argument for moving away from traditional numerical based indicators as an assessment of investigator performance begins to expose the limitations of National Occupational Standards. Furthermore numerical based KPIs do not appear to fully appreciate what skills and practices are useful and valued for the role. In addition to this there is an over simplification that putting poor performing practitioners with top scoring ones will lead to better performance by the former, consequently literature in the last decade is rich in examples of software programs that identify top performers based on DNA and forensic evidence recovery, fingerprint hits etc. What is not considered is how tacit knowledge can be transmitted, this analysis demonstrates that to develop expertise it is necessary to first understand how the work is performed and examine what other practices performed by the investigator have worth. This has remained elusive for some, section 1.3 explored how Kelly (n.d.) tried to capture the essence of what makes a top performing crime scene practitioner, although highly interesting and grounded breaking for its time Kelly (n.d) acknowledges that there are few solid recommendations to adopt in pursuit of this goal, there is “*no magic bullet*”. Something Ericsson, Roring and Nandagopal (2007) have considered more widely. They write that body size and weight aside there is no evidence for giftedness.

A more analytical approach using Grounded theory tools of classification, coding and technology to observe work has been put forward as being a useful method to capture more than the frequency of forensic products.

Expertise theories have shown that these approaches have worked in a multitude of dynamic domains consequently a strong argument is proposed that these methods have the potential to gain a better understanding of how the Forensic Investigator performs.

The following chapter describes a blend of normative and ethnographic approaches to help understand how the Crime Scene Investigator examines a crime scene as well as providing markers on what to look for when trying to understand the development of crime scene examination expertise.

## 2 Chapter 2 Methodology: Exploring the use of technology to capture crime scene examination work.

### Introduction

In this chapter sense is made of practitioner practice by first detailing a study to examine the differences between expert Crime Scene Examiners and students who were about to study a crime scene forensic module for the first time. A short review follows laying the foundation for the main programme of field research using Volume Crime Scene Investigators in a natural setting. This chapter specifically addresses Question 3.

*Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?*

Here the experimental approach and justification of these methods is discussed and continues the approach outlined in Chapter 1. These methods specifically have been adopted to elicit examples of expertise development and also what stimulates it. Furthermore the construction of this methodology also opened up the exploration of what aspects of practice are or should be valued which do not appear in traditional KPIs or clearly depicted National Occupation Standards. This was necessary since question 4 specifically examines alternative perspectives to observing VCSI work which is not currently captured but has worth in developing the CSI and VCSI.

### 2.1 Research paradigms: Qualitative vs. Quantitative

This thesis explores the practice of Volume Crime Scene Investigation by studying crime scene practitioners in simulated and real world environments. This study utilises new technologies to observe and record forensic investigator practice. Reflection, expertise and expert performance literature provide the theoretical backdrop. These have a long history in similar studies in nursing and teaching, (Ericsson, Whyte and Ward, 2007; Fadde, 2007; Johns, 2005). Moreover Feldon (2007) states that:

*“Experts’ free recall of strategies introduces errors and omissions into instructional materials that hinder student success. In contrast, when experts engage in structured knowledge elicitation techniques (e.g. cognitive task analysis), the resultant instruction is more effective.”*

This provides early evidence as to why expert testimony may be unreliable as data, unless it is highly structured. Nevertheless it is apparent that a push for direct observation and analysis as a method is necessary. Fadde (2009) also examines a method to push advanced learners to “*hasten expertise*” citing Crime Scene Investigation as a possible beneficiary of instructional design and Recognition-Primed Decision (RPD) making. It is therefore appropriate that the end destination of this work provides clarity that performance indicators need to capture the practice of examiners and not solely the product of the examination.

Creswell (2007) provides much needed support in identifying an approach to qualitative research or ‘inquiry’. The text explains that the need to overly justify a qualitative route is no longer needed, although the need to position oneself in the study is certainly important and warranted. Creswell (2007, p. 18) emphasises that researchers bring to the research their own interpretation, and values. These axiological assumptions may be tacit, but without question do, or have the potential to, influence the design and subsequent analysis. Charmaz (2006, p. 67) also emphasises the need to acknowledge and declare the purpose of research. This enforced transparency is necessary, or repercussions in every facet of the work is likely; none more so than the issue of ‘*validity*’. In this instance the emphasis is on ‘pre-conceptions’ and forcing data into categories based on previous experience. This ‘common sense theorising’ is arguably much more likely to occur unless personal checks and balances are implemented. This next section discusses this point but it is worth being mindful that a key purpose of qualitative research is to uncover the unknown in what may be a familiar setting.

### **2.1.1 The researcher: acknowledging previous experiences.**

Crime Scene Investigation is similar to the nursing profession in that practitioners, and former practitioners, have provided much of the training and research in the domain. This is often under the banner of action research, where the focus is to bridge the gap between theory and practice (Rolfe, 1996). Crime scene examples are certainly fewer in number with discourse still thin on the ground, however Smith *et al.*'s, (2005, 2008) crime scene investigation task analysis, observation and technology studies illustrate practitioner-led research. Others have explored the forensic products of crime scene work, notably fingerprint identifications and DNA database hits, to model performance (Adderley, Townsley and Bond, 2007).

The research for this thesis is governed by prior subject specialist knowledge. It is important to concede that these “basic set of beliefs” have guided action (Guba, 1990, p. 17) and that these actions have been constructed from experiences in the field of crime scene investigation.

### **2.1.2 Choosing a paradigm to suit the research questions**

Creswell (2007, p. 22) helpfully unpacks “four worldviews” which inform qualitative research, these worldviews structure activity in how it looks and operates. *Post positivism, Constructivism, Advocacy/Participatory* and *Pragmatism* are all given fair hearing. This thesis is perhaps most aligned with Pragmatism, a paradigm that uses elements from all the other three paradigms picking and mixing the most appropriate tools for inquiry to further understanding. It is perhaps impossible not to be reflexive at this juncture in that the structure of the thesis and many of the methods adopted have a post positivist feel, certainly in terms of its layout and “*scientific approach to research*” (Creswell, 2007, p. 20). However understanding Volume Crime Scene Investigator practice can be achieved through coding and memo-writing. These historically lend themselves to Constructivism or for some Interpretivism standpoints (Charmaz, 2006). Bryman (2004, p. 438) provides

support for mixing methods and that classification of some kind may not fully encompass research activity and that labels cannot properly define or explain the endeavour. Furthermore it would be wrong to label a researcher carrying out a survey, or structured interview, as being necessarily committed to the “natural scientific method” or indeed aligning oneself firmly to purely quantitative methodologies. Mason (1996, p. 139) recognises that there may be proper reasons to explore causal relationships, these themselves would to many be followed through by adopting a positivistic perspective, however these alone may not fully answer or allow detailed understanding of the phenomena or the research aims (Clark, 1998). It is fair to state that qualitative methods and the tools associated with these provide the foundation for this thesis. Indeed it is perhaps also insightful to state that these become stronger as the writing becomes more detailed. Nevertheless quantitative procedures are implemented to make sense of what at first appears as chaos, or provides an opportunity to see the emergence of patterns in the observed work.

It is impossible not to smile at the title and attempt by Woodside (2010) *'Bridging the chasm between survey and case study research: Research methods for achieving generalization, accuracy, and complexity'*, to bring together different research methods, not simply in terms of tools but also at a prejudicial level. Woodside highlights the different methods and sets out the proposed argument for and against each one, for example thick description, case study, survey, positivistic research or empirical study etc. In essence it is the world of correlations and statistical significance versus qualitative rich descriptions. The latter often involving the complexity of data, its presentation but equally interpretation and the reliability of these interpretations. Woodside (2010) innovatively presents research methods not as a two dimensional clock as seen by Weick (1969) but instead as a three-dimensional box. It is a simplified clever illustration presenting the different approaches, by plotting General research against Accuracy. This is perhaps the first hint that small sample size research has a part to play provided that it is seen as a case study, with Grounded Theory tools used to explore the research questions.



## 2.2 Observation Methods

### 2.2.1 Differences between laboratory and in the field studies

Observation is perhaps one of the most used methods in research. Bisantz and Drury (2005, p. 63-71) provide a comprehensive account of the different types of observations available to the researcher. Alison, Snook and Stein (2001) also provide a detailed study of observation methods in policing and more specifically forensic research. Their paper whilst paying close attention to Webb's (1966) methodological approaches has a more realistic feel, acknowledging archival data such as crime scene report forms as well as interview data and direct observation. More importantly Alison, Snook and Stein comment on laboratory research (an environment where variables are controlled), and mirrors this with real world data. Data in the latter environment is messy, uncontrolled with further complexity surrounding what to and what not to view.

*"Researchers working 'in the field', however, do not have the luxury of being able to separate independent from dependent variables and must rely instead on making sense of complex, multivariate phenomena."*

Crime scene examination is perhaps subject to more controls in terms of research; Alison, Snook and Stein comment that to research police officers requires one to view the real world as it is occurring. It is a necessity to view them in this environment as artificial settings cannot recreate the nature of detection and apprehension of criminals. A solution is offered for this work in the form of a framework, a method setting out what is intending to be viewed.

Technologies can be tested before implementation in the real world, (Baber, *et al.* 2009) or to observe Crime Scene Examiners and their ability to form teams (Smith *et al.* 2008) when dealing with more complex crimes. Bisantz and Drury (2005 p. 66) do draw a distinction between an observation and a controlled study. Here the:

*"unaltered, uncontrolled natural setting vs. A controlled laboratory environment."*

Their work however primarily dealt with naturalistic or "pseudo-naturalistic

*studies*” (p. 66). Little is covered in relation to using head-mounted camera technology, although video recordings from abstract angles are considered. These however do not produce the view point of the participant. Bisantz and Drury go further by stating that cross fertilization between the human factor engineering approaches and social sciences is taking shape, the lines of demarcation are more blurred especially where the aim is to understand tasks and actions from the perspective of those being studied. The work of Lincoln and Guba (1985) is cited, and their approach to naturalistic research and inquiry in general is deemed a strong example to follow. Whilst not stated in detail by Bisantz and Drury the work of Lincoln and Guba is principally qualitative and arguably provides one of the best examples of ethnographic study. There is also a shift in the research question when researching in a field setting. Hypothesis testing becomes much less important, with the main goal being to uncover new aspects of practice; to gain a deeper and more complete understanding of phenomena. Events and situations cannot be controlled for, with research being more inductive than deductive. This understanding may also be presented in highly detailed descriptive accounts, the example of Artman (2000) being particularly applicable as it not only looked at team skills, situation awareness, but also incorporated the analysis of verbalisations from participants. This should not be thought of as unstructured or ill disciplined, rather this approach to field studies is likely to lead to specific hypothesises which can be tested in a simulated or pseudo real world environment. This in turn connects with the expert performance approach as outlined by Ericsson, Whyte, Ward (2007) in the previous chapter, and as a concept has already been presented for Crime Scene Examiners (Butler, 2009).

### 2.2.2 Opportunities for using naturalistic data

Field notes and associated observations can be coded, with the results turned into a quantitative product (Miles and Huberman (1984). There are also occasions where access to the field environment is limited or hazardous and consequently the opportunity to explore or test certain aspects of practice is problematic. Woods (1993) advocates the use of simulated settings provided the expert engaged in the task has the same freedom as that presented in the real world. Moreover the phenomena being studied may be regarded with the same critical eye as a field setting: making redundant the boundary lines between the two different environments. Cannon-Bowers, Salas and Pruitt, (1996) appear to offer caution in the field of naturalistic decision making. This tone is expressed in *so-called real world* observations under naturalistic conditions. Cannon-Bowers, Salas and Pruitt offer perspective in that before naturalistic settings are used and accepted as the real world the real world indeed needs to be studied in order to define what is acceptable, appropriate and useful to study. Campitelli and Gobet (2010), review Herbert Simon's decision making approach commenting on complexity in real world events. Decision making is bounded and does not follow rational lines. This approach offers secure footing in what may be examined in a naturalistic setting. It is possible therefore to expand on this perspective and propose that if field work can steer controlled experiments, controlled experiments can steer field work: especially where access to the field environment is limited or heavily restricted. Aspects of practice can be viewed, retested and provided it is acknowledged that these events are happening in a simulated environment, they may provide markers on what can be homed in on in the field setting.

Situation Awareness as a theme emerged from the literature in the previous chapter. It seems appropriate that Situation Awareness is governed by searching strategies and what sense is made of artefacts in the crime scene setting and how these are interpreted and connected to other artefacts. Work based polices that relate to this are clearly legitimate areas of exploration, and provide a legitimate argument for both simulated and field studies.

Cohen, Manion and Morrison (2007 p. 396) identify some key reasons for observation data, notably that the benefits of live data can be more rich and offer a deeper insight than second-hand accounts. Other benefits are that participants may provide a different account of what they do in comparison to what is actually done, as already described in the previous chapter. Simply put practitioners may be unable to explain procedures or methods of work. Cohen, Manion and Morrison helpfully unpack the different elements or facets of observation, these can be fact based such as the frequency of a particular part of work or resource, for example the number of times a piece or work is done. These broad terms can be mapped over to include specific crime scene work such as the number of times a specific fingerprint brush is used. Observation can also be more interpretive, such as the reporting of behaviour, signs of stress, or frustration. Furthermore observational data also allows material to be generated about the physical setting. That is the environment in which the work is being conducted. It also allows capture of participant characteristics through their interactions (Cohen, Manion and Morrison, 2007, p. 197).

### **2.2.3 Applying qualitative tools.**

How *observation* is analysed depends principally on the data collection method being employed. Structured observation in the form of an observation schedule generates a series of ticked actions over a given time frame. Altheide (1987), pins out the term *content analysis* as well as explaining the differences between qualitative and quantitative research, (or perhaps more precisely 'data collection'). Here qualitative analysis is expressed as evolving and whilst a framework may be applied to data, this framework is not pre-existing. Instead it is derived out of the data. More importantly *data* receives explanation in its own right. This work is commented upon by Sandelowski (2000) but not before explaining the perceived negativity of descriptive research and qualitative research as a whole in the community. It is not by chance that qualitative software has evolved to tackle quantitative sticking

points, an aspect commented upon later. Nevertheless the framing of qualitative research by Sandelowski is open and clear, with *constant comparison* forming the backdrop and data sampling being purposeful or even “eclectic”. Researchers stay close to their data with words, events and situations all having meaning that governs the process. In a footnote by Sandelowski mention is given to phenomenology as well as to statistical methodologies that are applicable once data framework labels have been constructed and decided upon before affording some form of statistical approach. What is apparent in this paper is that the argument for pursuing *description* and *understanding* is both rich and complete. This is not without problems as results do not instinctively present themselves, instead sense and meaning need to be formed and extracted.

Gallwey and O’Sullivan (2005p. 747) make remark that analysing video is awkward and time intensive, however the Observer software package marketed by Noldus allows specific keys on a standard computer to act as labels. Every time the activity being researched is observed a key is pressed, which in turn records the frequency of that event. With current versions of Observer XT, it is possible to observe a range of audio and video files (Lilley electronic mail, pers. comm, 15<sup>th</sup> November 2010). Moreover statistical analysis can be generated at the end of the research which calculates the frequency of these activities. Whilst its use in measuring body positioning may be abundant (Gallwey and O’Sullivan, 2005, p. 748) it is equally well placed to record crime scene activity, (Lilley 2010). Similar products, but without the statistical element or ability to run video programs directly through the software, are ODLog produced by Macropod and EthoLog version 2.25. ODLog is priced at \$100 (correct at time of writing) and has a modern windows user interface whilst EthoLog is a shareware product (Ottoni, 2000). EthoLog however is limited to running on windows operating Windows NT or lower. Videos can be run in either the background or on separate computers with the user selecting appropriate key strokes to record activity. Similar more cost effective systems may also be created within spread sheet packages such as Microsoft Excel. Here symbols or clip art can represent specific

artefacts within the crime scene which act as action buttons, each time these are clicked using a mouse or tracker pad, a frequency count is generated and where appropriate the duration between selected symbols being selected is also recorded. The process works by writing a series of macros that recognise the repeated elements in the program.

Research into expertise and performance has followed a number of different paths, most notably in the field of human factors, engineering disciplines as well as in more social science domains. This thesis aims to bring these two approaches together to explore the practice of the Volume Crime Scene Investigator. The argument presented is that rather than seeing qualitative and quantitative data collection as wholly separate, it should be considered that both positivism and ethnography standpoints can inform each other, and indeed investigator practice as a whole.

The building blocks and method to answer the research questions have been explored with a push towards inquiry based research, uncovering phenomena specifically decision making, situation awareness, expertise development and digital technology as an observational tool to capture work as it occurs. Arguments for both simulated and field work to research practitioners has been explained as well as which data analysis method best fits the research aims. The following section presents a methodology for a simulated highly quantitative study which explores differences between expert and novice crime scene examiners. The writing then moves to a field study of participants, post training and engaged in actual crime scene investigation work.

The first experimental component of this thesis sets out what the differences are, between the novice and expert Crime Scene Examiners in their searching strategies. A better understanding of the Forensic Investigator is sort through observable differences in their responses to a simulated crime scene environment. Themes exposed in this study informed the coding of role profiles before moving to the field study. The literature review has presented a document analysis for how examiners are monitored, that is key

performance indicators, examples of this may be found in appendix D. The simulated novice, expert study and later field study using operational Volume Crime Scene Investigators aimed to uncover what other aspects of practice are important to capture as well as how the examiners develop their expertise. Before this development can be observed it is necessary to see where differences are found; these differences provide a viewing glass to observe work in the real world environment.

The following section explains the research in working out some of the differences between expert and novices in the field of crime scene investigation. The results are used to compare against employment role profiles, in essence detailed statements about what knowledge and skill is required for the role. These are then used to construct themes to test and develop in an ethnographic study. This study also connects with theory, (*expert performance approach*) in that it aims to identify the skills experts have and where these are found in the forensic examination process.

### **2.3 Study 1: A methodology to compare 'expert' and 'novice' Crime Scene Examiner searching skills using eye-tracker technology.**

Eye-tracking technology was used to provide an insight into the visual searching strategies of novice and expert practitioners. The main research questions governing this work were concerned with the number of artefacts viewed and the amount of time they were viewed for. Further qualitative work examined verbal and written comments made by the participants.

A mobile eye-tracker was placed inside a backpack; this allowed participants to move with the device rather than run simulations through a fixed screen computer. Further tests on the morning were carried out and as a consequence, rooms in the crime scene laboratory with less light in them produced better results. A room not used in the study was designated as a preparation room. In the preparation area paper markers, were positioned around the room, these were used to calibrate the eye-tracker for each participant. Initial tests ensured that the location of these markers was appropriate for calibration. Eye-tracking systems work by analysing the infra-

red signal from the human eye, at times the sensor became confused or erratic in bright conditions. Since the tracking marker is influenced by infrared from sunlight (Zhu and Ji, 2005). This is not always eradicated however its effect may be minimised.

The location for the research was a Crime Scene House facility at Teesside University. These are designated laboratories with the inside fitted to resemble a business premises, shop, bar, or in this instance a house. The property was formerly a dwelling for student accommodation and so the dimensions and fittings lend themselves for burglary investigation, coupled with it being one in a row of terrace houses.

### **2.3.1 Participant selection and description of expert Crime Scene Examiners and undergraduate level 4 students studying a Crime and Scene Examination module.**

Experts were chosen by contacting the Scientific Support Managers of three police forces in England, the criteria for selection was specific and connected with the literature as discussed in the previous chapter. Practitioners needed to have five or more years of volume crime scene investigation experience and had to be top performers in terms of their number of forensic identifications. These are current performance indicators measures as used by the Scientific Support Managers to identify good performance. If these individuals were not available then those regarded by their peers as being highly proficient at volume crime investigation and were given training responsibility by their managers for this task were also recruited to be participants. This was an important point as some individuals were once top performers however their figures were no longer in line with others because they had been given other responsibilities such as training or managing other staff. This study was able to get a mix and blend of practitioners to make up the expert group.

The crime type selected for the research needed to be presented at a sufficiently low level to enable novice undergraduate students to be able to perform the tasks required. Of the six 'expert' participants, five were male



and one was female with a mean age of around thirty eight, representing three police forces. All six novices were enrolled on a variety of forensic or criminal investigation degree pathways and were studying a crime scene investigation module. This module covered the basics of evidence recording and recovery, however each student had only recently started the module and none had any former experience of police or forensic work.

Participants were requested to examine two rooms, with each room representing a different scenario. The scenario was written in the style of a police initial communication log, detailing the time, identifying the call sign or collar number of the police responder, as well as any description that would be fitting in this instance. Skill was needed to make sense of this information, not only with the content but also the format in which it was presented. The typeface of the print was also presented in such a way as to mimic a printed log.

### **2.3.2 Description of simulated crime scenes and associated exhibits.**

#### **Scene 1**

Scene one was a lounge on the ground floor with an open window. The window had been forced from the outside, with a flat bladed instrument causing marks in the uPVC frame. The opening latch of the window was unscrewed to allow the window frame to be opened fully enabling an offender to enter. The screws to the window were left under the window and grouped together. A smudged footwear mark was positioned on the outside window sill. This was purposefully covered with a black plastic bag to mimic first police responder or house holder preservation. The lounge had two, two seater settee's; cupboard units; furnishings such as flowers; candles; photographs; a light stand; television; video and DVD inside a multi-media unit.

06:13 Complainant Simon Pendle states his property has been burgled in the night whilst he was asleep. Attempt made to steel DVD player, wallet containing

£50 cash and cards taken. Apple iPod touch and Philips DC910 iPod decking system also believe stolen. Total value around £1k. No signs of disturbance in other rooms.

08:13 Update PC 2324 Gibson at scene. Crime Scene resource will be needed, will update with further details.

09:06 PC 2324 updated: Crime report taken and brief house to house, nothing seen. Entry via front lounge window, pushed too due to inclement weather. Good footwear preserved on the outside of the property window sill. Since arrival complainant could not find vehicle keys and on checking the rear car parking vehicle is believed to have been stolen. Request update PNC, vehicle is a Ford Fiesta registration details T75SPJ value £800, incident reported to have occurred overnight whilst complainant asleep. Complainant needs to go to work and is arranging lift, key holder (@ No2) is a neighbour and will stay with SOCO. Availability all day.

## **Scene 2.**

This scene consisted of an office environment within the Crime Scene House. This environment was introduced to model modern living along with laminate flooring. These features allow students to practise in a setting that simulates the real world environment.

This scene was constructed differently to scene one in that the scenario was that of a staged burglary. This was not made open to the participant groups. Clues and cues to this were to be found in the excessive amount of material reported stolen, along with a window forced from the inside and a footwear mark being left on the inside sill. The footwear used to make the mark was left inside a plastic bag under a table. The contents of drawers were also tipped out. The log was also heavily populated with expensive items that had been stolen. The log for the Office scene stated the following information:

17:00 Complainant Mr Jarvis reporting a burglary while at work, address No 4 King Edward Square. He states that only one room searched as alarm not activated. Computer and electrical items from his office have been taken: New Acer Aspire 7720G laptop computer value £545, a Samsung ML-1640 Mono laser printer

value £70, a Tom Tom One XL Classic SAT NAV along with £425 from the desk drawer.

18:27 PC 2142 updating arrival at address.

19:38 PC 2142 updated, scenes of crime requested, entry believed by forcing top opening window, force marks observed. Footwear mark on floor of office reported not being there the previous day. Confirmed no other rooms disturbed, alarm sensor in landing and alarm not activated. Exit as Entry. House to House completed, elderly occupant next door states nothing seen or heard. Complainant available for a visit all evening and all day tomorrow.

The results for this pilot study and the associated discussion can be found in the following chapters. The audio and visual data was coded which allowed a deeper understanding of how crime scene searching activities are carried out between novices and experts.

### 2.3.3 Eye-tracker Verbal Protocol Framework

Each participant's *'talk-aloud'* was transcribed using a transcription template (Bryman 2004, p. 366). From these transcriptions it was possible to construct a framework from which to compare both groups.

Table 2.1 showing category framework used to analyse verbal statements

<b>Modus Operandi</b>	References related to the point of entry and actions or activity of the offender(s). Motive or associated intelligence for the offence was also captured in this category.
<b>Objects</b>	References related to objects in the scene such as <i>chair, table, lampshade</i> .
<b>Evidence</b>	References related to physical evidence or the potential for evidence, for example fingerprints, footwear marks, tool marks.
<b>Scene</b>	General comments in relation to the environment or action that had occurred, for example: plastic bag covering a footwear mark on the windowsill.

These experiments formulated the strategy to begin the field work. This field work provided the structure on which to measure and understand crime scene examination practice. The function of the novices in the above experiment was to highlight what differences in practice are apparent between the two groups and to observe whether this connects with theory in this domain.

Dynamic work such as crime scene examination is not easily captured, moreover controlling for variables is problematic in the sense that interaction is part of the process of the examination. Furthermore conversations (once the controlled experiments were over) suggested that live field studies would generate other rich data. For example, only expert participants expressed concerns at not being able to engage more with the scenario, or requested additional information and so wanted to demonstrate their capability. Interestingly whilst managers and supervisors were willing to send staff to be studied as part of the experiment; staff themselves were reluctant and insecure about the research activity. They however were willing to be viewed in the real world environment. On this point one expert practitioner asked prior to the experiments if feedback would be provided.

Lundin and Nulde'n (2007) emphasise that the police world is closed with limited access for academic research, despite an influx of documentary programmes. Where research has been initiated it is often driven internally bringing about change and modernisation. Examples of this modernisation within the United Kingdom crime scene context have historically explored geographical position of satellite departments and the incorporation of other duties (Williams, 2004). These duties concern service delivery, providing a more integrated approach to work by identifying what is done during the crime scene examination, and in some instances making redundant attendance of other roles. Consequently the taking of witness statements and completion of the crime report form can now be carried out by the Volume Crime Scene Investigator. Whilst in others, a civilian investigator or uniformed police officer is assigned to these tasks. The actions of these parties may request the attendance of a Volume Crime Scene Investigator to

deal with the recovery of forensic evidence (Elmhirst, 2010).

The work of the Crime Scene Examiner is consequentially critical to the recovery of forensic evidence and interpretation of the crime scene.

Understanding adopted procedures and the analysis VCSIs carry out is useful to having a better understanding of the role and the development of investigator practice. Moreover this is further evidence that field studies are necessary to capture how this performance is demonstrated. Detailed appreciation of what and when specific activities occur provide a viewing platform to inspect decision making, assessments and strategies.

Furthermore activity sampling or structured observations also make apparent interpretations and evaluation skills investigators utilise whilst at the crime scene. In conjunction with these skills are also the influences that manifest whilst working through the examination strategy.

#### **2.4 Interim review: Exposing the limitations of eye-tracker technology and the move to the real world environment to study individual Volume Crime Scene Investigator practice.**

The eye-tracker study (study 1) had exposed many useful results that informed existing knowledge of how investigator practice is carried out. It generated many frequency counts that showcase what is done differently between the two groups and in terms of searching there are real statistical differences which are presented in the Results Chapter. However there were also some significant limitations to the study that were not foreseen and consequently led to the formation of study 2, a study of individual Volume Crime Scene Investigator practitioners in a real world environment. The first insight into the limitation of the eye-tracker study came from off camera comments from three participants representing the expert group. They stated that they would not examine a scene unless the home owner was present, despite the scenario stating that a neighbour was the key-holder. They went further and stated what would be recovered in 'reality' is dependent on what police area operations were planned or on-going, for example instrument marks would not routinely be recovered unless an operation was running that planned for offender tools to be seized.

Examining properties with only a key-holder is common place however the expert group expressed their frustration at having limited information. In addition their role and the subsequent recovery of forensic evidence are also governed by external factors such a policy decisions.

Study 1 the simulated experiment identified a number of points that needed to be addressed.

- To properly get a detailed impression of examiners doing volume crime scene investigation work required real world data as conflicts arose when information sources were closed in order to control for variables in the experiment. This suggested that time and effort (by the examiner) is spent gathering data: information and intelligence in order to inform the examination phase.
- Exploring the frequency of evidence recovery on the crime scene report forms did not illuminate more about the practice, although the Discussion chapter suggested that identifying evidence did not seem to be problematic for the novice group.
- The Expert group explored fewer areas in their visual examination (Figure 3.8) suggesting that they understand what surfaces are better than others for potential evidence enhancement or recovery. This suggested that energy is spent understanding and analysing the surfaces on which potential evidence may reside. A more dynamic environment would therefore be challenging and again supports the notion that the enhancement of forensic evidence such as fingermarks is not divorced from searching.
- The Expert group in their commentary spent much time explaining what they needed to do next or what resources they needed to utilise. Planning and preparing resources or actions were clearly important and needed to be investigated further as this was a common statement that separated out the expert group from the novices.

A member of the expert group requested feedback from their results during the initial workshop on verbal protocol analysis, this was not part of the

briefing but it did highlight the desire for feedback and the opportunity for reflection. Reflection therefore warranted further study, exploring where it fitted into crime scene investigator practice. Additional comments from the expert group commented on the eye-tracker and backpack digital recorder, stating they quickly forgot about wearing the device although it was difficult to keep speaking aloud. The verbal accounts however were extremely useful in establishing what exactly was being viewed and what was not. It was apparent that the examiners did not search or examine surfaces in isolation to other tasks, moreover the expert group expressed frustration as not being able to engage in communication and information gathering as they believed it governed their examination strategy. These themes needed further exploration in the real world away from simulation and the controlling of variables. The observation framework needed to expand beyond information gathering about the modus operandi or the collection of evidence but instead required a deeper more insightful perspective of investigator practice.

To properly explore how Volume Crime Scene Investigator practice is implemented required a detailed study. Verbal protocol analysis on think aloud data was useful in making tacit knowledge overt, moreover it also placed context and meaning around decisions taken. Since the expert examiner group expressed their feelings on the structure of the work it was necessary to capture reflections in the field study. These reflections were general comments and specifically concerned crime scenes attended using the head-mounted camera.

#### **2.4.1 Examining the role 'Tools' play in work as additional evidence for the move to observe real world practice.**

Interestingly Lundin and Nulde'n (2007) purposefully discuss 'mundane' work within the Swedish police service, their work focused on police tools which stimulates or activates learning within the practice of work. The term mundane work could perhaps have been emphasised even more, nevertheless the connection to how mundane work contributes to building expertise is an important point to recognise. Everyday work unconnected with

serious, organised or indeed major crime contributes to developing skill.

Moreover to complete this work requires skill and expertise.

The concept of *tools* and *mundane work* clearly maps over with the research into Volume Crime Scene Investigator practice. Not only are they seen as legitimate areas to explore but highlight that lower less important practices do need research attention.

The bulk of the work by Lundin and Nulde'n was from observations and interviews: as a methodology this is viewed as reliable. Lundin and Nulde'n are honest in the difficulties faced when conducting research activity in this domain, illustrating it is a world closed and away from society.

Participant discussion in Lundin and Nulde'n's study revolved around tools.

Tools are expressed as more than artefacts, physical objects but equally have a representation in connecting individuals, forming a community. The notebook as a tool is afforded special attention as its contents are more than a written record of witnessed events but can also offer a window into competence. The police note book is not a substitute for police reports but as an aid memoire in recording observations as they happen. Indeed they are a primary source of evidence: a factual account. Notes such as these are often referred to as contemporaneous notes (Smith *et al.* 2008; Houck and Siegel, 2010), notes made at the time of the incident, observation, interview, or examination. Many crime scene personnel have access to a note book however their primary record for their observations is their scenes of crime form or for others an electronic database such as Locard, Socrates and Socket (Schofield, 2007).

The crime scene form has a mixture of structure and freedom to record events, observations and forensic evidence. Structured components concentrate on forensic evidence whether these are: fingerprints; footwear impressions; tool marks; DNA material, or associated intelligence.

One of the key identifiable elements of the paper by Lundin and Nulde'n is that knowing the discourse of the practice, that is the domain, is necessary if practitioners are to integrate into the social structure. Being accepted and developing skill has its roots in developing practice and becoming more proficient. Jargon becomes important, a common language which is spoken.



Learning is therefore not a singular activity but a shared practice within the community.

Sharing practice was therefore a theme to explore in the research with the VCSIs, knowing it could be present was particularly important. This allowed strategies to be constructed which enabled the recording of events where shared experiences may be apparent.

It is important to understand the meaning and significance tools afford in learning, especially the police culture, as these tools are unlikely to be shared by other members of society or at least not in the same way. Through analysis they show how learning is organised and the tools that are used to support it. Practitioners therefore recognise through engagement, the importance in how these tools can relate to their learning albeit not always in an overt capacity. They are resources for learning, although they may not find their way into the reflective diary, and so require eliciting.

Interviewing the VCSIs to elicit these experiences was important as was the style of the interview. Early interview questions were not initially fixed but instead a reflexive process, enabling free movement in the conversation. This was a crucial part of the methodology as it not only provided insightful perspectives on methods of working but also served as a check and balance to aspects raised in the main research design.

## **2.5 Study 2: A methodology to capture crime scene investigator practice using head-mounted camera technology in the real world environment.**

This research project involved four female Volume Crime Scene Investigators (VCSIs) attached to the Workforce Modernisation Project and based in the same police command unit in a North East of England Police Service. Each participant had completed a degree in Crime Scene Science from the same University although not in the same year group. They had a mean age of 26 and a mean service level of 4 months prior to the study. The area of primary work they were engaged in was concentrated in the north of a large city centre, however investigators and control room requests required the VCSIs

to cover a much larger area than their primary base of work. The area is demographically densely populated with volume crime regularly reported. At the time of the project the investigators worked outside of the Scientific Support Department (this was reviewed and changed after August 2010) however communication with their scenes of crime colleagues was frequent with a mentor selected from this department. The mentor assisted in technical matters and provided feedback. Day to day supervision was carried out by a Police Sergeant in the Workforce Modernisation Department.

## 2.6 VCSI project initiation and ethics.

It has already been mentioned that access to police personnel for research is difficult. These difficulties are primarily concerned with confidentiality. Wiles *et al.* (2008) provide a gripping insight into the management of confidentiality and the difficulties researchers face. Examples are concerns about harm to the participants and also accidental release of discourse and how this should be managed (Kaiser, 2009). This latter point is particularly interesting and whilst informed consent is a pre-requisite (Miller and Bell, 2002), (along with some formal mechanism to record it), instances occur in police work that are spontaneous and not always properly foreseen. The consequences of these instances for the participants could be serious in many different ways. Moreover these instances are likely to arise where trust or a prior association is apparent with the researcher and the participants. Wiles *et al.* (2008) put across that:

*“...confidentiality is closely connected with anonymity in that anonymity is one way in which confidentiality is operationalised.”*

This definition also includes not identifying an individual based on what is reported and not just their name or place of work. The content consequently is important to consider not just in terms of research data but also as a tacit marker to identify individuals. These issues are multiplied where small groups or case studies are fundamental to the work; along with an ethnographic

approach. The balance evidently needs to be struck with participants informed of their right to remove all or part of the data. Participants should also be informed that their responses or behaviour may be construed as controversial; compromise their position within their employer; identify themselves or others; or has the potential to result in criminal investigation. Guidelines are clear (BSA, 2004) in that where public safety is a concern, or some illegal act is being planned or already happened then researchers may need to inform an appropriate law enforcement agency. Whilst never raised in this research it was discussed that should occasions arise of neglect of duty or issues of safety, then it would be necessary for the researcher to inform supervisors.

Wiles *et al.* (2008) uses the work of Masson (2004) *Doing research with children and young people* to illustrate this point. Fox and Lundman (1974) recognised this issue in their paper *Problems and strategies in gaining research access in police organizations*. This is not to say that controversial research cannot take place in the police force; Sanders (2008) incidentally presents a compelling argument for examining personality traits in police officers.

The head-mounted camera field study field ensured that all participants needed to be informed of not only what the research was about but the mechanisms to withdraw and how supervisors would respond to mistakes observed.

Discussions with the Work Force Modernisation Project (WFM) Chief Inspector began in July 2009. The WFM was a project set up to bring together specialist services in a 'one stop shop' approach with Volume Crime Scene Investigators engaging in taking crime reports as well as the forensic examination of crime scenes and recovered property.

Deloitte (2010) produced a report for NPIA Home Office (now College of Policing) and reviewed the implementation of WFM across a number of police forces, identifying which forces took part and the outcomes.

Furthermore it identifies the transferal of roles from the "Response Officer" to police staff, in this instance VCSI for a North East Police Force.

In the WFM a Detective Sergeant and a Detective Constable were assigned

to deal with a number of areas concerning the proper recording of documentation and establishing an audit trail, the full duties are identified in Appendix C in the Project Initiation Document (PID). This commitment was at an operational level ensuring that the requirements of the VCSI project were feasible and monitored on a regular basis. Threats and opportunities to the work were discussed at project development meetings and formed the material for the Project Initiation Document. Much of this work was geared around ensuring the scenes were recorded and copies filed according to the appropriate standards for the collection and collation of unused material. At a strategic level the project needed support and sign off from the Learning and Teaching Department within the Police Service, the area Superintendent where the VCSIs were based along with the Chief Constable who ensured the project was recorded as a project with a defined exit strategy and measureable outcomes. These outcomes were steered towards gaining a deeper understanding of investigator practice. They included where expertise may be apparent and what lessons can be learnt for VCSI development. These outcomes were also aligned to performance indicators listed in the police service's business plan. These are defined as objectives in the Project Initiation Document and cover two specific areas: their first being the Human Resource Strategy (2009) and the Joint Policing Plan (2009-2012), these can be found in Appendix C section 2.2 *Links with other force projects and programmes*. The themes expressed in this strategy plan relate to the innovative use of technology in developing the work force and how they themselves can contribute in a positive way to their own operational effectiveness. The areas represented in these strategy document had much connection and commonality with the four research questions presented in the Introduction section of this thesis.

Preparation and approval meetings lasted seven months. These discussions involved the purpose of the project, benefits to the Police Service and where these benefits aligned with performance indicators set by the government. A letter of proposal was accepted and a joint contribution was made with the risk log. A VCSI project handbook was written detailing the methods of data capture and approaches to data analysis (Appendix B). Association of Chief

Police Officer authority (ACPO) was provided early in January 2010 with the project going live 8<sup>th</sup> of February 2010.

The participating police force were more than simply gate keepers to crucial resources, instead they were partners and beneficiaries. They invested time with the VCSI to help them understand that they were important, as was their development and how they could benefit the police force in which they served. All managers gave their support and acknowledged recording work can be seen as invasive but that any mistakes observed would be met with support, even minor verbal indiscretions would be tolerated provided they were not offensive to anyone individual or group. Having a point of contact for the VCSIs to go to about this work in their own place of work was important, it demonstrated commitment and that the research was not separate or divorced from everyday work. This engagement was anything from reminders about charging the equipment to requesting the VCSIs record their crime report interview with the aggrieved party to enable the Detective Constable to check the right questions were being asked and whether assistance could be provided.

This additional activity was needed to support the research endeavour, Lee (1987) provides a highly interesting account on the value of simulations, their benefits and costs, a factor discusses in the previous chapter, perhaps most interesting is Lee's acknowledgement of access including negotiating with gate keepers.

*"The researcher often must negotiate a way past gatekeepers who control access, and who may be reluctant, hostile, or dubious about the research. Often, too, where access is gained, it is the result of establishing some kind of "research bargain" in which the activities of the researcher may be circumscribed in certain ways."*

The above is emphasised even more by Okumus, Altinay and Roper (2007) who suggest even in modern research publications, little attention is given to the work needed to get access moreover the time afforded to this process. Further to this the research may have to enter a research bargain, a *quid pro quo* where knowledge is shared. This has the potential to cause conflict if the research questions are focused on personal treatment or similar.

For this thesis consultancy was in way of regular meetings to discuss capturing performance and how to develop competency systems that were fair, less likely to raise concern by staff, allow staff greater freedom and flexibility to develop skills and knowledge that was specific to them. More formal presentations were also delivered to the Head of the Scientific Support Department as well the Training and Development Department. It should also be stressed that the research did not compare the performance between participants. This was felt to be necessary in order to gain trust and allow each participant to voice concerns without fear of repercussions.

A workshop on the research was delivered to the VCSIs, here the merits of the work were explained covering what material needed to be recorded and equally important what was not necessary. This was imperative as negative feelings towards head-mounted camera recordings still existed from earlier work in the department some 18 years previously which had percolated down from longer serving members to the new in service VCSIs.

All of the VCSIs were known to the researcher and it was important to ensure they were afforded the respect that their role demands as they were no longer students engaged on an undergraduate programme. Tong, Sainsbury, and Craig (2007) state that getting this right early on is necessary and requires careful management. They helpfully provide a check list guide on conducting qualitative research. Interesting this guide is concerned with pulling together all the elements from a meta-analysis. Under the section “(ii) *Relationship with participants:*” much is mentioned in connection with openness, the extent of the interaction and prior acquaintances to be divulged.

To give assistance in fostering openness a list of questions and answers was prepared beforehand prior to any interviews. The participants were informed that they would not be judged against each other nor would the material be used for disciplinary action as evidence for incompetence since they were all in early career development. Senior officers were present at the meeting to reinforce this important point. Having senior officers present to comment on this aspect allowed the participants to hear these words for themselves. It again was felt that ethics in this sensitive domain needed to focus on how the

participants would be treated, their preconceptions and not solely on how the sensitive data would be handled. Moreover it needed to include the impact on the victims of crime who may be present on the video recordings.

Each participant understood what it meant to obtain ethical release to do research work, a process that each of them had gone through as undergraduates. By having this understanding the security of how they would be treated was reinforced. Participants appeared to be reassured that ethical release had been given and would only be provided if the participants in the study were fairly treated. This was not considered at the start of the design and proved to be useful in establishing trust and built research collaboration. Participants were told that the research was not solely that of the Police Service or the University but instead they themselves were principle stakeholders in this work: their thoughts, understanding, ideas and commitment, was essential for the survivability of the project.

The work of the VCSI varies between police forces however there are many commonalities. The four VCSI in this project were requested to attend scenes by their control room as well as the Investigation Officers via a diary system. The scene attendance criteria concentrated on routine volume crime notably: theft from motor vehicles; attempt theft of motor vehicles; burglary other than dwelling; criminal damage and recovered property either stolen or believed used in the commission of an offence.

VCSIs did not attend burglary dwellings or stolen vehicles during the project unless accompanied by a qualified Crime Scene Investigator. The reality of working with this attendance framework is discussed in Chapter 4 since volume crime even with a strict attendance criteria became hard to define and adhere to. The definition of volume crime is covered in the previous chapter, with further suggestions that the frequency of the offence may be a marker as to whether it is defined as a volume crime, whilst in other police force areas it may be regarded with more seriousness in terms of its crime classification. In this project volume crime did not include burglaries dwellings unless operational demands required an exception to this rule.

An aspect not initially considered when designing this research was *'identity'*.

This is discussed in Chapter 4, however the relevance at this point at this juncture is that the participants were informed that even before they were employed, the role was identified for potential research because of its positive impact it has had on police business by their predecessors (former VCSIs now promoted to full Scenes of Crime Officer). This was again vital as volume crime is regarded as the lowest crime type in terms of priority, with research tending to focus on the crime patterns and associations of anti-social behaviour, rather than on Crime Scene Investigator practice.

The Thematic Inspection Reports discussed in the previous chapter notably Touche Ross (1987), Using Forensic Science Effectively (1996) Under the Microscope (2000), Under the Microscope Refocused (2002) and the Volume Crime Scene Manual (2003) have acknowledged the impact on society and the value forensic science can play in assisting in the detection of criminals. It is from these reports that the formation of the VCSI role was conceived in order to tackle crime such as that mentioned above.

## **2.7 The Interview process.**

Research interviews were usually carried out in a quiet room, designated as a board or meeting room. It had a partition to block sound and was away from all forms of other police work. The times for interviews were selected to have least impact on the VCSI in terms of when they were engaged in forensic work or administration duties. Consequently mid-afternoon often seemed the best time, because the VCSI doing an afternoon shift could check the logs and ascertain how much work was needed to be done in the evening, and then afford time to the interview. For those on the morning shift it was a time whereby they had completed their crime scene duties for the day and begun their administration tasks. The timing for the morning shift also was again important to ensure the interview was not rushed. It was necessary to be flexible between interviewees on the same day and make contact prior to attending the Police Station, to ensure that the day's activities could support this extra time.

It was decided early on not to use police interview rooms even if they were



free, as the environment was felt to be adversarial rather than fostering inquiry.

The VCSI participants needed to be aware that they would not be judged, nor should the interview have some ulterior motive. Furthermore this also prevented distraction to ensure the interview questions were delivered and the time not lost to discussing different crime scenes the participants had attended.

It should be stated that during these occasions not everyone would be on duty at the same time, VCSIs needed to remain in the office to answer queries on the telephone, or were expecting a police officer to drop in to ask case related questions. VCSIs at times also needed to engage in crime scene administration, but were still able to answer interview questions. Whilst initially believed to be less than ideal it quickly became apparent that this was another facet of their work and needed to be recorded and examined in more detail.

Perspectives changes as ringing telephones cease to be a distraction or an annoyance, but rather an opportunity for knowledge to be transmitted or other angles of practice made overt. Disruptions to the focus group through the VCSIs using computer screens to yield information in order assist the recipient on the telephone: became data. Notes made during these visits informed and explained behaviour at the crime scene.

It was decided that using the head-mounted video to record these events in the office would not be feasible, due to the large number of people that may be captured on the recordings. Scene based activity required the householder to give their permission or simply to remain out of shot, using the same strategy in the Scenes of Crime Office or more generally in the Police Station would not be practicable.

Through the organising of the interviews and finding an appropriate time slot in itself generated data about working practices. Whilst an interview is clearly a tool to make overt what may be tacit or to simply generate a deeper understanding, this process led to other questions surrounding the shift pattern. Furthermore connections were sort to explain how knowledge is transferred and when this occurs.

### 2.7.1 Interview rationale

The rationale for the interview questions was constructed from theory and also from the initial study using eye-tracking technology. The themes examined in the literature review and subsequently explored in the interviews were based on the following:

- Working practices. Here the organisation of the role was explored covering how crime scene requests were generated and by whom. The hours and days worked in the department, the travelling and distance to these scenes, the construction of crime scene report forms, dealing with disclosure and the resources or equipment available when carrying out an examination.
- Practitioner development. Participants were asked specific questions on how they practise; this section in the rationale was predominately from the theory of tacit knowledge, sharing awareness and being socialised into practice. The interviews aimed to expose when and where this occurred and in what form it appeared. The role of the mentor and supervisor was built into the rationale and how this was presented when participants showed their video recordings to the Senior Scenes of Crime Officer. This was especially pertinent when discussing how 'tools' were used and how this changed over time.

Shift patterns and their efficiency were considered in working practices as it connected with *organised work* as defined by Lundin and Nulde'n (2007). Organised work brings structure in terms of resource allocation encompassing who should be allocated, when and how. It provides stability to resource crime enquiries and their associated examinations. Their presence means that the day to day business can be maintained. Consequently employees can be abstracted for other tasks and annual leave. The police force needs to be organised, systems and routine need to be common place, by having a structured mechanism the need for communication and explanation is reduced or no longer necessary. Exploring

these aspects in the interviews was particularly critical, as it impacted on where and how VCSIs obtained their knowledge and awareness about events or practices.

Lundin and Nulde'n, (2007) make mention of practitioners being 'socialised into practice' this connects with Beach and Connolly (2005, pg. 172-175) and Image Theory. That is being able to subscribe to an organisations image or an identity, its beliefs, culture and mechanisms of work. These exist because individuals sign up to those very values and systems.

Engeström, (2004), on this point believes that learning takes places between people and the occupied environment. Interaction therefore is an activity worth pursuing: it leads to knowledge and skill, and may not always be observation based. Knowing where in the environment 'shared awareness' for the Volume Crime Scene Investigators occurred, would be highly useful for practitioner development. These experiences also showed whether these were ad-hoc spontaneous moments or purposefully sought after. Here it is the shared construction of events or interpretations by the practitioners that leads to the construction of new knowledge. Exploring what VCSIs talk about and how this discourse is manifested was an important topic for the interview strategy.

### **2.7.2 Role Profiles**

To assist in this process it is important to understand what employers of Crime Scene Examiners require as skills for the role. Employment role profiles were analysed and coded, these coded role profiles provided structure to the observations in terms of what was needed, what requires collating and how the context of the scene integrates with each of these parts. Role profiles may be found as attachments to a job application form, with sections relating to the job description, and what attributes are desirable and essential. Job advertisements are normally found in local newspapers where the post is to be taken up, on Police Service web sites where the position is based and in recent years on specialist sites notably

Allpolicejobs.co.uk. Some of these role profiles also used language significantly associated with National Occupational Standards, albeit more specific in parts. Whilst the limitations of the National Occupational Standards have been discussed in Chapter 1 these role profiles were an opportunity to ascertain what specifically police forces required. It is through this analysis that the observational framework was constructed on which to observe the examination practice of the Volume Crime Scene Investigators.

Forty-two job advertisements and role profiles from eleven Police Services for a twelve month period (between 2008 and 2009) were coded. These coded profiles provided themes on what employers believe are necessary skills and attributes. They also served as a bench mark to examine whether indeed other skills are used by practitioners that are not included in the profiles. NVivo 8 was used for the coding process and is explained further in this section.

### **2.7.3 Reflection diary.**

Heath's (1998a) research for using a reflective diary raises some interesting points. Certainly at the time of her writing it seemed apparent that the quality of reflection and its impact had not been properly evaluated. The only real aspect was that it became useful with numerous examples demonstrating its value and contribution to practice. What is perhaps most interesting is a real awakening to the real world environment, where reflection is not carried out as an academic exercise to complete a module or indeed as a component for some academic study.

*"Time constraints that may make frequent formal reflection difficult are recognised but the format that allows deeper reflection where time permits and skills develop."*

These are not the only issues. Heath (1998a) raises the point that the environment to learning needs to be supported within the work place, so that exploration of areas that require further work are assisted and mentored. Moreover the act of completing a reflection, the introspection, analysis and evaluation are simply too much for some preferring to leave such matter well alone. There is also the argument that reflection diaries are merely a written

account for actions that happen as part of everyday work.

Johns (1994) advocated writing on the left page and leaving the right page for further analysis, however Heath (1998a) states that practitioners found this 'difficult' to carry out and whilst she puts this down to 'conflicting advice' it nevertheless raises concerns that this is the most appropriate method. Johns (2010) still recognises this some twelve years after his initial writing and guidance. McClelland and Suri (2005) strongly put the case for a diary, suggesting this is an opportunity to record events as well as emotions and unlike direct observation it is an opportunity for a participant to record their activities without being supervised.

The four VCSIs as part of the field study were requested to carry out reflections on their recorded scenes. Although not all head camera scenes were recorded properly, where recording was attempted, this did yield a reflection.

Of the four VCSIs one specifically expressed a wish to type up her reflections, indeed this was considered early on and one of the reasons the VCSIs were left with a Netbook with word processing software installed. Her expressed wish to use the Netbook was principally concerned with being able to type faster than she could write.

The VCSIs were given a workshop on what reflections could contain; this workshop was an informal session explaining the nature of the research and that where possible reflections were not to be a repeat of the actions at the scene.

Whilst the Discussion Chapter (Chapter 4) provides much of the account of the success of the reflections it is important to note that all participants were allowed to approach and record their reflections in whatever format enabled retrospective thinking. All participants have engaged in reflection in some capacity as part of their undergraduate degree in Crime Scene Science. Further advice was contained in the handbook provided to each participant, as to the nature of the research methodology and the duration.

Heath (1998a) states that in her example practitioners only reflected in a descriptive way and reverted to novice mode, clearly demonstrating that

reflection is a skill in its own right with a structure and order to its learning. It should be reinforced that the participants in the VCSI study had a mean experience of four months prior to the research project commencing. It should be noted that much of the first month was taken up with Health and Safety Training; Airwave communication training; in force procedures such as, Socket recording (crime scene computerised notes); Race and Diversity and a general awareness of the Police Service structure. Of the four participants one had experience of around one year, two had three months and another had just started. Since each participant had an undergraduate degree in Crime Scene Science, initial training was limited to a few days, issues from this are raised in the interviews carried out.

Reflections from the VCSIs were overall around one page of an A5 book and in some instances were bullet point notes with brief sentences constructed around these points. Heath states that perhaps inexperienced practitioners require more learning whereas experienced practitioners can explore their vast practical knowledge allowing them "*heightened awareness*". Schön (1983) gives an insight into how novices perform by explaining the concept of framing. Although it is not really appreciated what a novice is or what constitutes a novice, nevertheless the broad explanation of their practice is still important to consider. Heath picks up on this point in that novices:

*"fail to find solutions because they fail to identify the true nature of the problem."*

This is noted by Chi, Feltovich and Glaser, (1981) where physics novices (eight undergraduate students after one semester of mechanics) were compared against an expert group, (eight PhD students). It was reported that experts took longer to assess the problem, rather than working through standardised rules and procedures.

The Results Chapter presents the reflections as a series of categories (nodes) or emerging themes. This was possible by transcribing the reflections into NVivo 8 (later reformatted for NVivo 9). A simple process of highlighting transcribed accounts followed by coding allowed data to be organised and scrutinised. These coded sections were filed under larger

categories and consequently emerging themes. The use of software of this type is far superior to traditional methods of multiple photocopies and the cutting out and collating of specific reflected accounts.

#### **2.7.4 Using Head-mounted Camera Technology and the Digital Video Recorder (DVR).**

Unsworth (2001) raises a poignant note and whilst no mention is made in the case report specifically to expertise she nevertheless discusses the work of Schön (1983) in that professionals *“know more than they can say”*.

Furthermore her opening abstract considers:

*“Studies of clinical reasoning are essential if we are to extend our knowledge of occupational therapy practice, better communicate our work to clients and colleagues, and reveal to our students the nuances of therapy that cannot be gained from texts.”*

Although the genre is different to VCSI work it nevertheless chimes with the research questions presented in the literature review. Here there is a desire to understand and learn about investigator practice. To not only provide discourse, but to educate those engaged in practitioner development. Unsworth’s paper is clear that new methods in data collection in this domain offer a deeper insight, these being think aloud methods, free recall and audio and video assisted recall. The argument proposed to embrace this methodology is that:

*“studying clinical reasoning in the complex real word therapy environment presents many challenges...”*

These points are echoed by Brown, Dilley and Marshall (2008) even being embedded in the title of their work *“Using a head-mounted video camera to understand social worlds and experiences”*. Interesting Brown, Dilley and Marshall express the benefits of such technology to capture practice. They suggest that the that the video images can be coded using NVivo 8, although no examples are provided as to how this could be achieved, what it could

offer the researcher or indeed what the output would look like. Nevertheless it is the *own view position* and the lack of researcher intrusion that is discussed. What is expressed early on is a drive which they claim is dominating sociological theory and methodology in that more is desired beyond “linguistic, verbal and cognitive.” More attention is being given to the sensory, emotional and habitual aspects of when participants are studied. In addition it is also presented that in general visual media is still “underutilised ... and this is especially the case in relation to head-cam video.”

Observations by a researcher present during therapy sessions in themselves raised complications, namely choosing the most appropriate session, the impact on those undergoing therapy and the timing of these sessions may be problematic. Further to this Unsworth (2001) suggests that quantitative methods are perhaps limited in their presentation to uncovering practice. She has instead focussed on how the equipment operated, and with this a distinct qualitative feel to the work using transcribed accounts of how the equipment worked during therapy sessions. On this point was a general theme that both the therapist and client appeared to forget about the camera. It is not known how long this took however it is explained that this time frame was significantly brief, with only one therapist reporting that it was not always possible to get close to the client and the camera on occasion provided a distraction, especially with children. These are important points but ones that were unlikely to be raised with the VCSI field work, first because VCSI work is practical based with little prolonged interaction with others and secondly the size of the camera is significantly reduced in comparison to the study by Unsworth (2001). The head-mounted camera used by the VCSIs is also smaller than that reported by Omedei (1994). Omedei (1994) make reference to the camera being positioned in a backpack and Unsworth (2001) is helpful by providing an image of the equipment during a live therapy session.

(Comparisons are also provided later on in this section.)

Unsworth expresses a desire to understand decisions in therapy, questions asked, strategies to overcome difficulties are all illuminated through using a video camera and think aloud methodologies. It has been argued that this is an appropriate exemplar for VCSI practice, certainly in terms of



understanding how practice is organised and initiated. The robustness of the equipment features little in the case report. Whilst similarities between the research questions presented in this research design have links to the work of Unsworth the practical applications of the tasks are wholly different. Parker *et al.* (2008) do however examine what tests should be performed if the head-mounted camera and recording equipment are to be used in a more robust setting. They examined the productivity and workload of rural fire-fighters, whilst less attention is given to the cognitive elements, certainly in terms of the work by Unsworth (2001), the appropriateness for the VCSI study also suggests that Parker *et al.* (2008) can provide an exemplar. The aim of the firefighting research was to provide a better approach to dealing with the stress and physiological strains endured during operational work, along with improvements to health and safety. Whilst much was made of monitoring the heart rate and such like, the key to understanding practice, was through employing helmet-mounted cameras. This approach was selected over others for a number of different reasons. For example: data needed to be obtained from a real world environment, to fully appreciate the activity involved. The dangers surrounding this kind of work prevented observation in the field along with the speed at which activity or decisions needed to be delivered or implemented. An observer in the field may also serve as a distraction, hazard or influence the activity being researched. The helmet fixed video camera also offered the perspective from the participant and not the researcher. This is a point Kipper (1986) raised in previous research. McClelland and Suri (2005, p. 302-306) consider the possibility of using discrete cameras to reduce disruption to activity, using a time lapse camera. These are arguably feasible offering much advantage in simulated setting but are not practical in real time at crime scenes. Barron (2006) explores this aspect in that unobtrusive monitoring equipment can be positioned in certain situations. It is appreciated that all research has the potential to influence activity in the real world where the participants know that research is taking place, however complex camera equipment in the real world is problematic, although not impossible. Consequently a mobile option to capture domain practice is crucial for crime scene work; albeit with many

of the issues being shared with other dynamic occupations and where high impacts are uncommon.

The durability of the device and ease of use were clearly important aspects for Parker *et al.* (2008) to test prior to going live with the field study. Specific tests involved rapid movement of the camera, whilst it is not clear why this test was carried out it is proposed here that digital cameras often suffer from a lag, that is real world movement is not always captured or processed quickly enough and in some instances devices can '*hunt for focus*' (Yong, 2009). During the trials by Parker *et al.* certain internal hard-drive units could not sustain shock induced activities such as running and jumping.

Like the Parker *et al.* (2008) study the head-mounted camera needed to respond to the movements of general crime scene duties although not the extremes of fire-fighting. A factor not considered by Parker *et al.* (2008) is the recording and capturing devices being subjected to sub- zero temperatures, this in particular is discussed in the Chapter 4. This is unsurprising given Parker's global location for this research and associated activity.

Following on from the results and conclusion of the visual searching strategy, research was carried out into different types of head camera devices used for surveillance monitoring. The device selected had a built-in microphone and came with a small belt mounted digital video recording device. This was viewed as being a cost effective practical alternative to the mobile eye-tracker without the need for lengthy calibration times (requiring an additional operator to assist in calibration) and allowing full range of examination types to be captured (Whitford, McLennan and Omodei, 1998) without restricting the investigator to powder free examinations.

Two types of DVR devices were purchased with interchangeable head-mounted cameras. The cost of these was £400-£500 each. Other cheaper versions were available however many of these did not come with a digital water mark time and date stamp, a necessary measure as live data from crime scenes would be subject to disclosure as defined in the Criminal Justice Act 1996. This equipment was tested on the bench in a laboratory, examining its field of view; response to varying light; battery life, and

transferability of data from either the hard drive or Secure Digital High Capacity (SDHC) data card. Additional trials used undergraduate students to test the equipment in simulated scenes, examining comfort, environmental conditions and sound capturing capability amongst background noise. Compatibility tests were also carried out with the Netbook provided to the VCSIs using a card reader with a Universal Serial Bus (USB) connector. Here data could be stored onto the SDHC card from the DVR, then placed into the card reader before being connected to the Netbook via the USB port. This was a similar process used by VCSIs when downloading images from their digital cameras. Imaging burning software was installed onto the Netbook to allow each scene to be copied onto a Master and associated Working Copy compact or DVD discs, depending on the length of the video recorded and whether it exceeded the 700 Mega Bytes of data allowed for a Compact Disc.

The bullet camera used was an ER-14 Tactical Headset Wired Non-Covert CCD Camera Kit. Conventional cameras using 35 millimetre film set at a focal length of 50 millimetres have a perspective similar to the human eye (Gampat, 2009), the shorter the focal length of the lens the wider the perspective given. The ER-14 Tactical Headset Camera had an angle of view of 78 degrees, affording good quality close up work as well as being able to set the scene in context with its surroundings. An additional feature of the lens was its ability to work in direct sunlight and low light levels with street lighting or torch being the only light available. The iris afforded rapid change to these conditions.



**Figure 2.1** Photograph from Unsworth (2001) showing a head-mounted camera and back pack



Note difference in size of camera device. ER14 is much less intrusive, worn like a pair of spectacles and is only visible from one angle.

Figure 2.2 Photograph of author demonstrating the ER 14 head-mounted camera



Figure 2.3 Photograph of the PV500 Digital Recorder and ER 14 Head-mounted camera



Figure 2.4 Image of the PV 800 Digital Recorder

The digital video recorder used in conjunction with the bullet camera has AV Input and Output, a wired controlled port, USB jack, Infrared Sensor for automatic recording and a Secure Digital High Capacity Card (SDHC) slot. The recorder could also be used with a remote control, either wired or wirelessly. The wired remote was also purchased to allow VCSIs to place the device in a pocket or clipped on a utility belt (along with Airwave communications and mobile phone) and still operate the Record and Pause features. The recorder also allowed complete playback either through the controls on the device itself or again through a dedicated wireless remote. Different file options were also available should the user require only audio material to be captured. An array of settings also allowed for storage either

on the internal 30 Giga byte hard drive or via the SDHC.

### **2.7.5 Data Coding and Analysis**

Charmaz (2006) offers much assistance in terms of what and how to code interview transcription data, echoing the work of Lincoln and Guba (1985) and the founders of Grounded Theory, Glaser and Strauss (1967). Whilst there are differences between the originators of Grounded Theory agreement may be found in coding data in a systematic and detailed way. Here it is proposed that themes and concepts will emerge through line by line coding. These codes become amalgamated into larger but related topic headings. These topic headings in essence form an overarching description of the theme with the intricacies being found in the units or coding references. Whilst this approach can be easily achieved through a series of post-it notes a highlighter pen and pencil, advanced computer software is available to manage this coded data (Maclin and Maclin, 2005). This research project made use of NVivo 8 and latterly NVivo 9 for coding all forms of transcribed data. Here the full transcription can be embedded into NVivo before each line or relevant section is highlighted and afforded a code. A series of tree nodes can be generated; these should be thought of as sub groups to a much larger code. Data (for example tree nodes) can be easily moved elsewhere either to other coded headings or as a standalone entity. NVivo also has the advantage of not simply being a repository of coded data but automatically forms a link to the original source material. This point is echoed by Rich and Patashnick (2002) since *free nodes* are also possible with information being cited as being stored elsewhere for example in a policy document or field notebook. Participants can also be grouped together or held independently in a series of cases depending on what is required. The benefit of NVivo 9 over earlier versions is that it is easier for images or video to be played and coded, segments of video can be coded and labelled in much the same way as written transcripts. NVivo 9 capitalises on this new addition with additional media formats being available. This facility is new with little mention of it in research methods literature. (This is important to note as at the time of

writing NVivo 10 is available, with research lagging behind the pace of software development.)

Alternatives such as mapping VCSI practice using Correspondence Analysis in SPSS presented a series of problems. This was because actions performed by the VCSI could not be singled out and directly associated with a particular verbal response. Moreover VCSIs performed some actions simultaneously. This would leave the analyst having to interpret which action was dominant over other actions. Correspondence analysis does offer the presentation of spatial plots however the data collated from the field work was complex and better suited to NVivo for this option.

NVivo 9 provided the solution in the form of a Cluster Analysis using a Jacquard's Coefficient, this allowed sections of video to be coded and assigned to multiple nodes. The sections of video could relate to specific actions as described above, the more frequent the assigning of data to one or more nodes would generate a greater degree of association, resulting in being more closely positioned on a spatial plot or dendrogram.

#### **2.7.6 Using NVivo 9 to collate and make sense of data.**

The use of NVivo 9 does not take away the power of the researcher, it is merely a useful analytical tool to make sense of complex data often through highlighting patterns in behaviour. NVivo 9 does not yet have the ability to make powerful statements about the sequence of codes, that is, which nodes come before or after other nodes. In order to combat this physical actions were coded up to and then during these specific actions. For example those actions that occurred before (the node) *powdering*, were captured or coded with a few seconds of *powdering* before the video was suspended. During this suspension the verbal codes if apparent were coded in conjunction with fingerprinting. As the video recording continued, new nodes could be assigned to the fingerprint process rather than be attributed to previous actions. This afforded a degree of continuity to data capture and its processing. Furthermore it placed the researcher in control of what was

captured, when and the sense that ultimately could be gleaned from these observations.

Different approaches to sampling are therefore critical and whilst made some years earlier the point by Foster (1996, pg 60-63) is interesting in that there needs to be careful, appropriate techniques with the data analysis method. Clearly this resolves the issue of two events happening at the same time. Flanders' (1970) sample time of 3 second intervals in the observation schedule is a classic example to minimise this issue and allows percentage scores to be created and presented. That is the amount of time afforded to specific activities. The balance needs to be struck as to what needs to be recorded; even a three second interval whilst highly regular may not capture important occurrences. Moreover if there is a desire to gather an understanding of the activity then this should not be substituted on the basis that frequency data is easily obtainable. The key to recording relevant data is to ensure that the framework is appropriate and will capture the activities being carried out, an aspect Galton and Egglestone (1979), implemented when comparing the teaching styles of over ninety teachers across different scientific disciplines. Qualitative data allows for the context of the scene to be explored, the conditions within the environment that may govern *strategy* or indeed develop learning. What needs investigating is how case studies revolve around tools, paying attention to the tools in the commentary of the Volume Crime Scene Investigators, their actions in their video recordings as well as their reflective statements. On this point and supports earlier discussion is Billet, (2004), where workplaces are seen as learning environments.

Edwards and Nicoll (2006) examine *professional development* and draw parallels to it being clinical. They posit a question as to what the difference might be between competence, artistry or indeed reflective practice. From an analysis of their work it would appear that they suggest that defining terms and stating what competences are is more complex than presented in the discourse. Perhaps the most interesting aspect is that *expertise* as a phenomenon is accepted as being indefinable, this work lacks any kind of structured narrative that neatly wraps up what expertise is but does state

what *expertise* should be able to do.

Questions could be raised as to what the difference is between this and professional competence and reflection? These are interesting questions and could be partly solved by examining the framework by Hoffman (1998) on where naive and experts lie on the spectrum of continued development. It is interesting in particular to see descriptions to expertise being likened to artistry, whilst not explicitly stated it is possible to unpack this concept. These are useful as it draws to a point the kind of themes or observations that are necessary in any field study. Should expertise be indefinable, then it is arguably advisable to resist the temptation to define it. Rather use what it should be capable of doing in moving forward to create a framework from which examples can be obtained and the context around those examples properly described. This in turn becomes useful to novices and apprentices in understanding the key decisions that are required of them and also what cues are important. Expertise consequently becomes practitioner led in that these examples come from practice, with practice and expertise being hard to separate.

### **2.7.7 Comparing Tech 5 with verbal recorded data.**

The scenes of crime report forms completed by the VCSIs were referred to as “*Tech 5’s*” by the examiners and Police Service for this area.





method to observe practice. Should there be no additional information present than that captured on the form, it could be argued that existing non-invasive repositories could be analysed, negating the need for intrusive video technology.

The Tech 5 forms are the examiners notes made at the time of the examination, often referred to as contemporaneous notes. These notes record the examiners name; date; crime number; offence location; (a later) generated computerised number once uploaded onto a database; a brief description of the location, *Modus Operandi*; a detailed description of what was recovered coupled with an exhibit number. These forms also recorded occurrences when crime scene addresses were vacant, or if properly was handed over to another. The amount of detail to report in the *Modus Operandi* varied not only between examiners but in particular for the type of scene being attended. Property examinations commanded little writing about the crime circumstances where as a burglary to a business resulted in much more attention in this area.

Each Crime Scene Report form was examined in detailed and compared to the transcribed data. Missing material not contained in the report forms was pasted into a memo in NVivo 9 with links to the original data source. The memo was then coded, with three themes emerging: *Background Intelligence*, *Modus Operandi* and *Evidence*. All missing data fitted into one of these three themes or nodes. A second researcher was used to ensure that the framework describing the three themes was robust (Landis and Koch, 1977), including the recoding of all coded references (n=47). In addition a Kappa inter-rater reliability check was also applied. Discrepancies were few in number and resolved by reviewing each one in turn. The results of this can be observed in the following chapter.

**Table 2.2 Coding framework for missing data not contained in the Crime Scene Report Form**

Background Intelligence	<p>Coding reference examples related to: where articles were originally recovered from prior to the forensic examination, the aggrieved being a repeat victim, or information concerning previous crime scene examination visits. Plausible reasons why articles were targeted or which offending groups were mostly likely responsible, were elicited through the information gathering phase of the examination but not always recorded.</p> <p>Additional detailed vocalised information captured in the verbal transcripts, were also apparent, for example serial numbers on property or specific detailed descriptions of property.</p>
Evidence	<p>Coding reference examples related to: direct evidence for example finger marks, glove marks and other trace evidence. Instances of ‘speculative’ samples in the scene notes were confidently presented in the verbal transcribed accounts as ‘actual’ evidence. Quality or evidential weight was also observed. Material recovered that may be considered for DNA analysis was not always recorded by circling the ‘Y’ indicator on the scene notes.</p>
<i>Modus Operandi</i>	<p>Coding reference examples related to: offender behaviour or crime scene actions, for example entry methods into the location, property and associated behaviour such as search patterns, interference of locks, either with nearby objects or instrumentation brought to the location.</p>

## Conclusion

This chapter has scoped out and explained the simulated and field research projects. Moreover the data capture methods have been supported with relevant literature justifying this approach. Early coding frameworks have also been constructed from which to view and make sense of Crime Scene Examiner practice. The building blocks of the analysis have been included along with the appropriate choice of software. The following chapter will present the results for the expert and novice group visual searching strategies (using simulated data) as well as the results from the ethnographic field study. Although brief mention of the findings is included in the following chapter, the full interpretation is presented in Chapter 4.

## 3 Chapter 3 Results and Initial Analysis

### Introduction

This chapter presents results from all the experimental data as well as an analysis of other elements of the research for example VCSI interview data and role profile analysis. The aim of this chapter is to answer the third research question and establish if the expertise development theories presented in Chapter 1 and the following experimental design and frameworks in Chapter 2 assist in having a better understanding of Volume Crime Scene Investigator work. Put simply did this research activity illuminate VCSI practice that has been shown to be novel, interesting and with promise in order to develop future Volume Crime Scene Investigators. Whilst the deeper meaning behind the results is formally expressed in Chapter 4, this current chapter formally answers the third research question.

It begins by presenting the data obtained from the mobile eye-tracker experiment (section 3.1). It includes a selection of still images from the video showing the calibration marker and the pupil cross-hair. The time taken by the different groups to visually examine the two simulated crime scenes as well as the number of comments related to the different objects within these scenes is also presented. The frequency of observations for the different crime scene objects was also captured.

These results allowed for early exploration between the novice and expert group and provided a strong steer on what observations should be recorded in the ethnographic field study. Without this early exploration the ethnographic field study would not have been as rich or recognised the significance of specific crime scene examination tactics.

The observation framework for the field study was constructed from an analysis of employment role profiles. These profiles were collated and coded using NVivo 9. The profiles were from eleven different Police Services that had advertised for the post of Volume Crime Scene Investigator or Crime

Scene Investigator. References to serious or major crime from the CSI post advertisements were ignored. The themes generated from this analysis are presented in Table 3.11 along with themes that emerged from the literature review as being important for expertise development. These tables provided the framework on which to code the video and audio data.

A *cluster analysis* was employed to identify which of these themes or more specifically *nodes* were correlated. These correlations allowed for a deeper analysis of investigator practice as the cluster analysis was presented in a three dimensional spatial model, representing which nodes were corresponded together and which nodes were not. Simply put it is possible to observe which thought processes such as strategy building occurred with which physical action for example powdering, documentation etc.

Each VCSI had their own spatial plot depicting their examination pattern; in addition data was also grouped for all participants. A spatial plot was then constructed from the generated grouped data, consisting of over 1300 coding references.

The three dimensional cluster analysis plots are presented alongside dendrograms. Dendrograms showcase the nodes in a vertical tree structure with NVivo 9 selecting the colour grouping for each cluster. These clusters are determined by selecting the number of cluster from 1 to 20. The number of clusters chosen is arbitrary depending on how fine or course the data is to be analysed (Ogden, 2011) and is governed by the number of nodes being examined. The data for each of the spatial plots can be found in Appendix G. In this instance the cluster number was determined by the correlation figure, that is to say a score greater than 0.5 (from a scale 0-1) was deemed to have sufficient correspondence that it was grouped as a cluster. Scores closest to 1 signify a greater alignment, of two or more nodes being grouped together. Consequently the clustering number was moved from the default of 10 to 8, to first identify clusters in the data and secondly to ensure the clusters had sufficient strength prior to an analysis of the qualitative material that made up these clusters. It should be noted that three dimensional spatial plots were

selected over two dimensional representations in order to view the spatial proximity in all planes: x, y and z. The spatial plot was moved about its axis in order to observe the proximity of each node in relation to others.

Interview transcripts examining what Volume Crime Scene Investigators feel is important to them and how they learn is also presented in the form of themes. Transcriptions have been anonymised to remove references to participants and colleagues. All other phraseology is presented as it was spoken. Where appropriate, pauses have been included with a record of the number of seconds taken before an answer was given.

At this point the mobile eye-tracker results are presented. This form of observation is referred to as *own point of view*. This term has been chosen because the lock of the infra-red signal tended to drift and was not always secure and so eye-tracker was not always accurate in the truest sense.

### **3.1 Eye-tracker ‘own point of view’ still images taken from video recordings.**

The following images are a selection of stills taken from both *expert* and *novice* participants. In the majority of instances the pupil lock was sufficient to be precisely clear as to what was being observed. Although there were instances where the pupil locating mark (presented as red cross-hairs) drifted, it was still possible however to be confident on what was being observed. This was because the object was still centred in the frame and corresponded with the verbal commentary.

The images below are from three different scenes. Figure 3.1 to and including Figure 3.4 are taken from the two simulated scenes (office and lounge) between the novice and expert group. Figure 3.5 and Figure 3.6 were taken again between a novice and an expert however this set of images represents further bench testing where fingerprint enhancement was being explored using the mobile eye-tracker. This work was not implemented in the

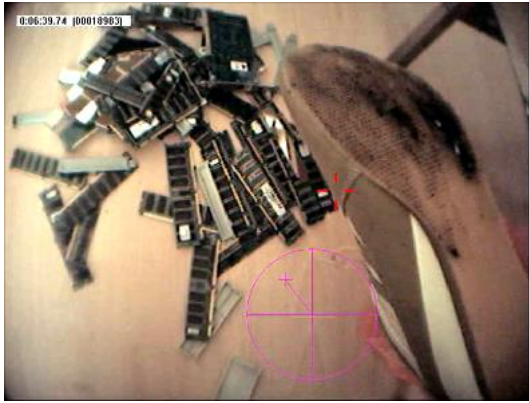
scene house for two reasons: first the novice group had yet to be taught fingerprint techniques however and more importantly early findings ruled out its implementation as each participant needed to wear a full visor to prevent aluminium, fingerprint powder finding its way on the mirror used to record pupil movement. The mechanisms involved to prevent contamination with metallic fingerprint powder hinted at this technology being used predominantly for searching strategy comparison and not for full crime scene examination.



**Figure 3.1 Participant (novice) makes comment about a fallen photo frame. Note eye-tracker cross-hairs locked.**



**Figure 3.2 Participant (Novice) searches room and makes comment about an open cash tin. Red cross-hairs locked.**



**Figure 3.3 Participant (expert) commenting on trainer design, colour and tread pattern. Red cross-hairs acceptable suffering only minor drift.**



**Figure 3.4 Participant (expert) examining window and observes force mark damage on the inside of the frame. Red-cross hairs suffering from drift however object is within the centre of the video frame.**



**Figure 3.5 Participant (expert) examining a bottle, note examiner uses overhead fluorescent light strip to illuminate marks post fingerprint enhancement. Torch is not used for searching.**





**Figure 3.6 Participant (novice) examining a bottle, note examiner uses a torch and is more reluctant to handle and move the object during this examination process.**

The video images were then analysed by initially creating a representation of the simulated rooms in Microsoft Excel using clipart pictures. These pictures depicted objects within the simulated crime scene. Behind these clip art characters, was coding that recorded the number of times each object was 'clicked' and the length of time spent on each object. This represented each time the participant looked at an object and the duration they looked at these objects for. The video recordings were viewed in real time with two researchers comparing their findings. From this method and coupled with verbal protocol analysis it was possible to ascertain differences between the *novice* and *expert* groups in terms of their viewing and searching habits.

### 3.2 Eye-tracker 'own point of view' graphical representation of data

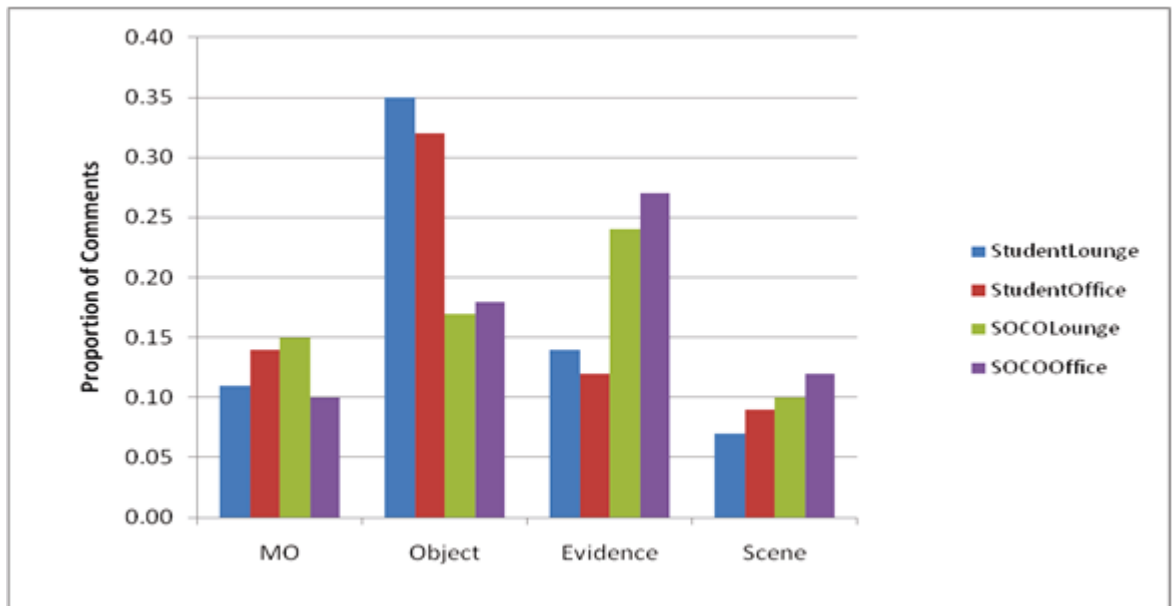


Figure 3.7 Chart showing proportion of comments produced by the two groups SOCOs (experts) and Students (novices)

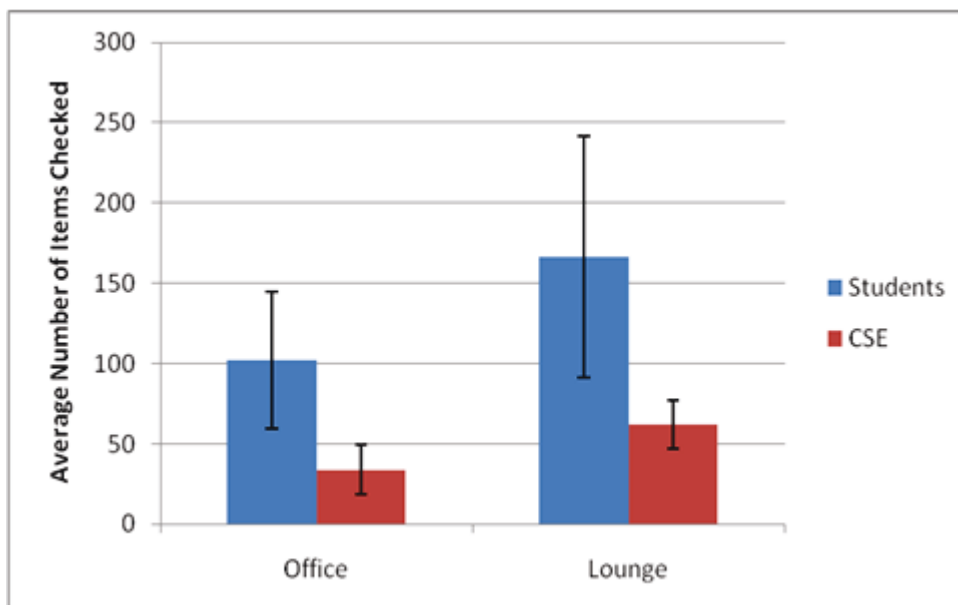


Figure 3.8 Chart showing number of items viewed between the two groups SOCOs (experts) and Students (novices)

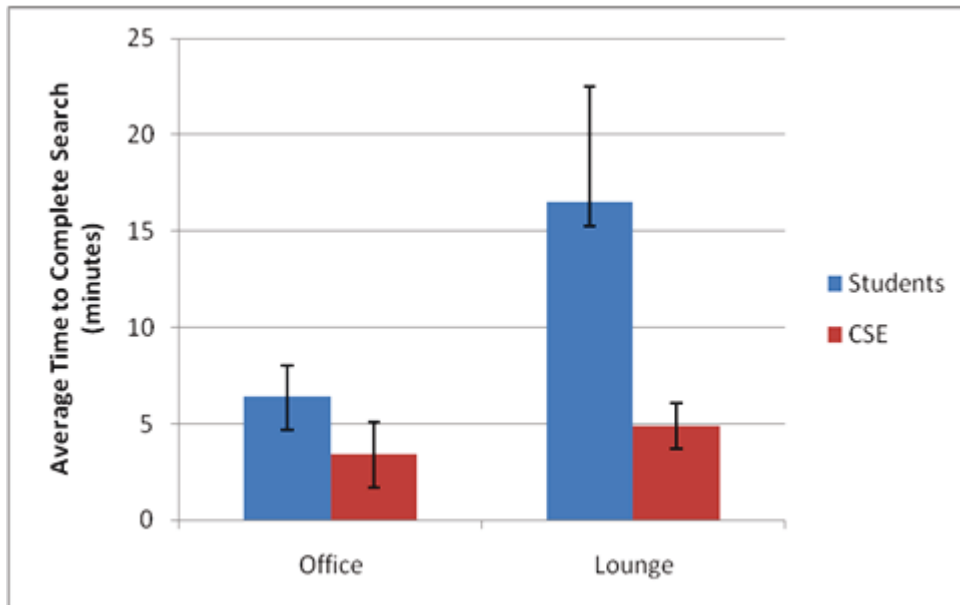


Figure 3.9 Chart showing Time in seconds for the two groups SOCOs (experts) and Students (novices) to examine the two simulated scenes

Due to the small sample size parametric tests or even testing for normality involving prediction about the population was not appropriate. Inter-rater reliability ( $r$ ) between two researchers was completed. Two researchers viewed and coded the video images from the novice and expert groups independently of each other.

### 3.2.1 Mann-Whitney U Test results for the Number of Comments between the two groups.

Figure 3.7 shows the distribution of statements across four categories as explained in Table 2.1. In total students produced on average 38 statements and the Crime Scene Examiners 28. A two independent samples Wilcoxon rank sum test suggests there is a difference between the two participant groups ( $Z=-2.309$ ,  $p=0.021$ ).

No differences could be found in the number of statements relating to the *Modus Operandi*, however differences were noted for the category *Object*, for

the office scene ( $U=5.5$ ,  $p=0.41$ ) however a difference could not be suggested for the lounge scene.

There was however a statistical difference between the two groups and for both scenes, for the category *Evidence*. Difference was greatest for the lounge scene ( $U=$ ),  $p= 0.002$ ) with the office being reported at  $U=3$ ,  $p =0.015$ .

For the category *Scene*, no difference between the two groups could be suggested.

### **3.2.2 Mann-Whitney U Test results for the Video Analysis**

This section allowed a comparison between the *own point of view* results with the verbal statements. That is to say, the number of times items or objects in the room were specifically viewed (rather than a general sweep) were compared to the verbal comments. Students are reported to have visually checked more *Objects* ( $M= 135$ ) than the examiner group ( $M = 48$ ). This is presented as  $U=3$ ,  $p=0.015$  for the office and  $U=0.5$ ,  $p=0.002$  for the lounge. Within the groups there was no statistical difference in the number of *Objects* checked by students for both scenes ( $U= 10$ ,  $p= 0.24$ ). There was however, a difference between the two scenes for the examiner group ( $U=3$ ,  $p= 0.015$ ), who viewed more *Objects* in the lounge than the office scene. The lounge scene was larger in comparison to the office however no one scene was more densely populated with objects to view.

Whilst frequency counts have shown differences between the two groups, it does not cover in sufficient depth what these practices are, or the judgements made whilst carrying out these tasks.

### **3.2.3 Mann-Whitney U Test results for Examination Time between the two groups.**

The mean time between the two scenes was different with participants spending longer in the lounge (Figure 3.9). Time was calculated the moment participants entered the room up to the moment verbal accounts stated the examination was complete.

Mann-Whitney U tests were used to ascertain the differences between the two groups for their examination times for each of the scenes: It is presented that students spent longer examining the office ( $U=4$ ,  $p=0.025$ ) and the lounge ( $U=0$ ,  $p=0.002$ ) in comparison to the expert examiner group.

## **3.3 Head-mounted camera field study results**

The following section presents the results from the ethnographic study of the four Volume Crime Scene Investigators based in a North East Police force.

### **3.3.1 Reflection Themes**

Each participant was required to complete a reflection of their recorded scenes. This recording could be in either a hardback book or on a Netbook. Both of these resources were provided to the participants. The Netbook was located in a private room away from the general office however only one participant (participant 4) used this resource. It was anticipated that each reflection would be a detailed account of the processes involved capturing their emotional state and feelings expressed during the examination phase. It was also anticipated that future actions and strategies would be explored and expanded upon. The reflections obtained tended to be key points rather than descriptive narrative, largely down to the time available for each participant, a point commented upon in some depth in the following chapter. Reflections

were important in that the context and meaning from the crime scene event could still be captured even if the video recorder failed or was corrupted.

The writing was in note form and often with the same style of short hand as that presented in the scenes of crime notes. Reflection narratives were often in bullet point form or short paragraphs where a particular event held meaning (Appendix G).

The reflections content was transcribed into NVivo 8 and latterly formatted for NVivo 9. Sixty eight reflections were obtained in total; each participant's narrative was copied, with sections of narrative being constructed into the following themes: *Describing the Scene*; *Evaluation of Self* and the *Crime Scene*. Evaluation of Self and the Crime Scene had a number of sub themes attached to it which are explained, these predominantly were concerned with *Attitudes and Behaviour* as well as *Evaluation of Practice*. A selection of the transcribed reflective comments has been included as evidence for each of these. A full list of the transcribed sections can be found in Appendix (G), these transcribed sections have been exported from the constructed nodes in NVivo 9. These nodes not only depict what references were captured but equally the location of each reference, and which examiner wrote it.

### **3.3.2 Describing the Scene**

The Volume Crime Scene Investigators spent a great deal of their reflections describing the scene and much of that description was in short hand note form. These descriptions were analysed further as the examiners were specific in what they described, the focus was on physical forensic evidence and the location of that evidence. The format was similar to the scenes of crime form and the manner in which the evidence types are described on that form.

**Table 3.1 Example of reflection comments presenting the theme *Describing the Scene***

<i>F/P (finger print) on the door/window area.</i>
<i>Possible f/w (footwear) mark on garage floor The cardboard box had a light fingermark on it</i>
<i>found f/p on o/s door frame</i>
<i>The attempt POE (point of entry) showed a small section of apparent blood</i>
<i>There were some cigarette butts on the floor to the unit.</i>
<i>and also a visible f/w mark could be seen on the rear windscreen of a Volkswagen Golf parked right in front of the POE. No visible DNA/trace other than some cigarette butts which looked reasonably old</i>
<i>Upon arrival at the scene, there were footwear impressions in ice/snow,</i>
<i>Glove marks were visible to the glass on both wing mirrors but with insufficient detail for comparison.</i>
<i>Upon visual examination of the vehicle I noted apparent finger marks underneath the FNS (front near side) window area.</i>
<i>Visible marks to FOS (front off side) door,</i>
<i>However, upon attendance, there was visible red paint transfer to the exterior of the doors.</i>
<i>There was also visible marks in the paint that potentially could be fingerprints</i>
<i>The hasp had also tool marks and was seized;</i>
<i>however surrounding apparent f/p</i>
<i>as visible mud marks on rear seat leading to front of MV (motor vehicle).</i>
<i>Visible footwear could be seen in sand at entrance to LHS (left hand side) garage</i>
<i>Upon examination visible ridge detail for finger/palm marks could also been seen in various places.</i>
<i>There was a tool left behind by the offenders.</i>

### **3.3.3 Evaluation of self and the crime scene.**

This theme is expected in reflection writing with the emergence of self-evaluation and being critical of behaviour and approaches to work. Within this theme specific behaviours were noted as the examiners described their emotions or attitude. Remaining positive was presented as self-praise and often accompanied with a description of the poor forensic evidence opportunities within the location of the crime scene. Evaluation of a scene was in many instances indistinguishable from evaluating oneself and that of the potential to recover forensic evidence.

#### **3.3.3.1 Attitude and Behaviour**

In a few instances examiners reflected on a change in their attitude or behaviour as they found forensic material or at least the possibility that it might exist. There were also examples whereby keeping positive was seen to be rewarded with finding potential evidence. The majority of examples were concerned with recording how one might be perceived, phrases such as 'professional' were used or explanations that suggest the right approach was taken.



**Table 3.2 Reflection comments presenting Sub-theme Attitude and Behaviour**

<i>kept positive (Evaluation) and found f/w and f/p.</i>
<i>offender was seen with gloves on - did not deter me as may have momentarily taken them off</i>
<i>wooden door negative at first but kept positive”</i>
<i>I feel I conducted my visit professionally as I could as I had no idea that the victim/offender would still be in the room</i>
<i>Though I carried out the examination in good positive, sequential way + manor.</i>
<i>acted in formal + professional manner.</i>
<i>Had I done this scene again I don't feel I would have done anything different. Not to say it was a perfect examination,</i>
<i>and whole family feel fed-up/annoyed/angry at all petty crime happening to them + neighbours - so was sympathetic + felt more determined to get a result.</i>
<i>I think I did really well and took an interest in the scene covering all possible angles, even the POE(point of entry) /exit to the garden.</i>

This last reflective comment suggests that this behaviour is not always the case when presented with areas leading to or away from the crime scene. Further on in this sub-theme comments centred on VCSI practice but with an evaluation of how a task or process was performed. The examples below can be seen as an extension of those above in that Volume Crime Scene Investigators were pleased with their performance. Reflection in these examples goes some way to ensure that good practice continues and not simply identifying areas of weakness. A sense of looking back is apparent combined with a sense of understanding and that a course of action or series of actions was correct. Moreover communication emerged as a strong factor with this communication being useful to generate intelligence to inform the examination.

**Table 3.3 Reflection comments presenting an evaluation of how task or processes were performed**

<i>I think I also worked well as part of a team with my colleague (participant 3), as I did the pub</i>
<i>I feel I did most things correctly</i>
<i>I think I used a good systematic approach and examined everything to the best of my ability and fully as I could, and recovered the best choice of exhibits that I could.</i>
<i>If repeating the examination I wouldn't change anything</i>
<i>Upon reviewing the footage of the scene I do not feel there is anything else I could have done</i>
<i>Good communication with IP to get brief/what's moved etc</i>
<i>Good communication with fellow VCSI (participant 1) re lifting f/w</i>
<i>Good use of roller - when applying lifter and when setting lifter on acetate.</i>
<i>Good concentration when using camera, not rushing process -&gt; made sure correct settings, correct position + focussing.</i>
<i>Good communication with IP to gain full info</i>
<i>Good initial visual for f/w in rear garden however poor visual on shed door as started f/p exam then noticed f/w mark, luckily did not effect gel lift of f/w.</i>
<i>Good use of gel lifts as visible marks on o/s of garage</i>
<i>Good communication with IP with asking which items moved etc + warning about lifters causing damage to paint work.</i>
<i>Great 2nd visual for f/p with use of torch.</i>
<i>I felt I did the right think by letting the pot dry out</i>

Whilst much effort in this evaluation sub-theme was concerned with examiners reflecting on variables that influence forensic evidence recovery: *evaluation* of themselves still continued to emerge. These comments are different to the earlier statements of *positivity* or *professionalism*. These statements are more personal and specific; they explore how vulnerable the examiners felt. This vulnerability is one of the most insightful and perhaps hardest for the examiners to reflect on and report. It was unclear with this research how many if any further instances of vulnerability were remembered but not reported.

**Table 3.4 Reflection comments presenting variables that influence forensic recovery**

<i>it brought back my initial feelings at this scene, there included confusion + difficulty</i>
<i>Quite nervous as it was my first property examination but knew I had my colleagues to ask, if needed.</i>
<i>I also found the scene examination uncomfortable + a bit nerve racking due to the size + extent of the factory ... but I think I was just rushing and trying to do an effective thorough exam in a short space of time, due to me feeling uncomfortable, which I did visually but not forensically so there would be many things I would change if I had to re-examine this scene again, the main one taking a colleague with me.</i>
<i>However, as there was already instructions as to what was being recovered and photographed I feel I went in 'blinkered' into the examination.</i>
<i>been to use magneta. Overall performance at scene ok – need to get more confident with my decisions.</i>
<i>The security guard remained outside during the examination leaving me inside alone.</i>
<i>I believe I felt a little uneasy with the security guard outside and nobody in the scene with me don't actually know why as I'm not normally edgy.</i>

Examiners also reported a notion that in general terms the opportunity to recover evidence from certain types of offences will always be fewer where offence types were outdoors. Here the object for examination is either unprotected or poorly protected with surfaces that are unlikely to permit a fingerprint examination. It is possible from these reflections to suggest that *surface construction or condition* is a variable or factor in the recovery of forensic evidence, specifically fingerprint evidence. It should be highlighted that this often impacted on *attitude and behaviour*. Many of these examples could have been pasted earlier in this sub-theme (Attitudes and Behaviour) as they provide comment on the emotional state of the examiner. However the reasoning was often specific and melded with other issues such as the condition of the surface and previous experience of attending these crime scene requests, actions of others on the environment or indeed object due to be examined.

**Table 3.5 Reflection comments presenting crime types and the likelihood of forensic evidence recovery**

<i>as with most OTD's (Other Than Dwellings) there is generally no potential for forensics.</i>
<i>Again with this BOTD (Burglary Other Than Dwelling) I felt there was going to be little prospect of any forensics</i>
<i>Not to be negative – sometimes it's difficult though.</i>
<i>I felt that this job was going to be have no prospect of a positive result with respect to recovering evidence,</i>
<i>When I arrived at the scene I felt that there was not much I could do after the visual exam</i>
<i>I felt this was another job which would not have much forensic potential as it was wooden, plus the IP (injured party) not knowing if anything was stolen</i>
<i>When officer first said "plant pot" I immediately felt disheartened however when I saw the pot it was nice + smooth ceramic, yes it had soil and dirt around o/s but I felt motivated to get a result.</i>
<i>just as if the other padlocks were newer and not rusted.</i>
<i>as the surfaces were all unsuitable i.e. wooden, rusty etc.</i>
<i>I arrived at the scene thinking there was nothing much I could do with the door</i>
<i>Initial thought train was leaning towards there not being a great deal from the exhibits as they were all textured apart from stickers on the items.</i>
<i>toolbox, however I had decided that the condition was poor and dirty/rusty.</i>
<i>raining heavily overnight so potential for forensics would be slim.</i>
<i>No viable evidence gained from examination of screwdriver as I believe DNA swabbing and fingerprint examination would be fruitless based on condition of the screwdriver.</i>

There are examples in the above that illustrate the examiner made these predictions based on the condition of the object: "it was wooden", however in the majority of cases the reasoning was not overtly recorded by the examiners. The opportunity or likelihood to obtain forensic material was linked to the length of time from the recorded offence to the proposed visit. The actions on the object for examination were not always known, although it was felt that this was still detrimental to the recovery of evidence. Evaluation examples were also provided, again predicting what may have occurred based on the inappropriate preservation method.

The above comments can be extended to the natural construction of surfaces and the frustrations these invoke when the examiner needs to conduct a fingerprint examination of these surfaces.

The reflection comments below build upon *surface condition* as a variable by exploring *time* and *actions* or the lack of actions as additional variables to the recovery of forensic evidence.

**Table 3.6 Reflection comments presenting time and actions as variables**

<i>Initial thought train was that as this had happened some 3 days ago it would be unlikely to yield anything forensic.</i>
<i>a day has passed since offence occurred felt dubious about getting anything from outside. so was excited to find something i/s (inside) possibly.</i>
<i>I do feel the worst part of the job was realising there would not have been much around the window frame (if at all) as the IP(injured party) had wiped around it to enable the tape to stick to it to cover the window.</i>
<i>Had the vehicle been clean and better kept. I feel the examination may have been more productive.</i>
<i>Due to car being valeted, probably little of evidential value</i>
<i>Annoyed that car manufactures don't make interior of cars from nice + smooth surfaces !!</i> –
<i>Initial train of thought is that there is unlikely to be a great deal of forensics to be gained as the vehicle has not been preserved at all</i>

Evaluation statements about the likelihood of evidence being collected or the quality of that evidence was commented upon frequently by the examiners in their reflection diaries. As the above statements show the probability of obtaining evidence or at least crime scene artefacts that may become evidence is based largely upon the variables **surface construction; time** and **actions**. Evaluations concerning the quality of evidence or its likelihood of being collected were largely tacit. That is to say within the meaning of a phrase about a surface's construction the opportunity to capture evidence was implicitly understood by the examiners. Consequently much time and energy was spent by the Volume Crime Scene Investigators analysing a surface or a situation, not always to reconstruct the events of the crime but to establish what is available to examine. This analysis was redrawn as a

separate theme and is commingled with many of the evaluative statements. These statements are stark where the comment connects with an emotion, such as feeling annoyed, or a sense of pushing on in a positive frame of mind despite the 'wooden door'. The analysis therefore warranted its own space as a theme to fully explore what is being analysed and how, especially as the Evaluation theme has shown it to be related to quality and sometimes an emotional response during practice.

The remaining sub-section to the theme *Evaluation* was concerned with the practice of crime scene investigation. Comments were often geared around specific crime scene techniques with occasional reference to interaction with a member of the public. These comments not only pick out what went wrong but at times there is an implicit understanding that by commenting on what needs to be amended there is an admittance on what is weak or underdeveloped. Further on this point *Strategy* was initially established as a standalone theme however the boundaries between knowing what to do next or recognising what needs to change and the evaluation as reported by the examines was blurred or even inseparable. Strategy was defined as actions or decisions implemented at the crime scene "I decided that bio-chromatic powder would work best..." The strategy was to use bio-chromatic powder based on an analysis of the surface or even past experiences. These are inseparable from statements such as "next time I will use bio-chromatic powder...as I think that it will work better than...". The difference between these statements is dependent upon when the reflection occurred and in what context, that is to say reflection before action, during action or on action.

Consequently the evaluation of practice had strategy examples as an extension within these comments. The following sub-theme *Evaluation of Practice* explores different areas within the domain in that it focuses at times on the application of some techniques or equipment whilst at other instances it becomes more concerned with the overall impression of how a task was completed. The following selection of reflection comments provides context to this sub-theme. A full discussion of the reflection themes and how they relate to theory is provided in the following chapter, however in some

examples it is apparent that reflection has occurred once the head camera video of the scene examination has been recorded.

### 3.3.4 Evaluation of Practice.

**Table 3.7 Reflection comments presenting the sub theme Evaluation of Practice**

<i>I was also disappointed with the result of my photos when copying them to disk, as the quality of them was quite poor</i>
<i>However, be aware + careful not to over powder my brush when F/P items.</i>
<i>Be more aware when F/P to use a face mask, as I know that the powder gives me a bad chest.</i>
<i>as I rushed damaging the mark (if it had been one) when I touched it, to see if it was just a mark on the paint surface.</i>
<i>Stop saying..... "Do you know what I mean.....", as it sounds awful.</i>
<i>Be careful when handling things i.e. in this case the Budweiser can, where you put your fingers etc.</i>
<i>This is an area I need to improve on, I cannot seem to get the mixture right for the casting medium so that it dries relatively quick, especially in the cold. I have learnt that adding more hardener helps it set quicker but still need to perfect that technique.</i>
<i>and I feel it is a more efficient way of recovering marks than powdering then lifting with tape.</i>
<i>Even though I managed to recover a gel lift I feel that sometimes the public like to see that powders and brushes have been used to them it appears a "better" job has been done.</i>
<i>After speaking to SOCO supervisor (supervisor's name) about my examination, I would now have taken tool cast of the cut mark, to identify size and width etc.</i>
<i>I would now be more aware of taking tool casts of the actual marks, such as cuts, for measurement invest, regardless of striations being present or not.</i>
<i>To take more care + accuracy when numbering exhibits.</i>
<i>However, after putting the first fingerprint lifting tape on the bottle I thought it may have been more suitable to have used a gel lifter</i>
<i>Shouldn't really speak whilst doing DNA swabs!</i>
<i>Don't press too hard with brush – try keep to just tip!!</i>
<i>Should have worn a mask as I think I inhaled a lot of brass powder (which is in my lungs now!) will know for next time.</i>
<i>Remember to swab before powder – I get over excited and opened property that didn't need forensic exam before property that did! However corrected myself in time.</i>

<i>Should have used oblique lighting to look for marks in the dust on the saw.</i>
<i>Examination was rushed as room was needed for a meeting (that's why footage skips from visual to end).</i>
<i>black powder would have created even more of a contrast,</i>
<i>Upon reflection I should have used the tripod to photograph the footwear marks in case they didn't cast adequately.</i>
<i>I need to get the tripod out and become more adept at putting it up so I don't look incompetent when it comes to using it.</i>
<i>Should have taken digital images before applying my F/P lift – but thought I did ok to realise this + then commenced to take digital images.</i>
<i>I should have used a torch as well as the available light to look for any marks before powdering</i>
<i>Don't use roller too much/too hard on painted surfaces as could cause the paint to peel off with gel lift.</i>
<i>I note that I could have used a zephyr brush to apply the aluminium powder – I have a habit of using the brush I take out of my case first but am confident in using either to apply</i>
<i>things I would most definitely change would be, never trust + the some else's equipment,</i>
<i>Maybe should have F/P examined the CD's on the floor of the MV</i>
<i>and taken elimination prints from the relevant IP's?</i>
<i>I must be careful when handling objects with possible F/P's/forensics on,</i>
<i>apart from being more careful touching items with possible f/p/forensics present.</i>
<i>I know I must be more conscientious</i>
<i>It would have also being easier to f/p examine the boxes I recovered at the scene, rather than recover them as they were un suitable for f/p examination,</i>
<i>I also maybe should not have contacted "name removed" the on duty SOCO in front of the IP,</i>
<i>I should have photographed my f/p lifts from the radiator/s also, which I always do as I know it's best practice to, but due to the nature of the scene and my initial feelings at the time I didn't, and I should have also examined the POE/Exit</i>
<i>Be more aware of sequence of examination i.e. Visual DNA recovery - F/P</i>
<i>Make sure I have all my equipment at hand to me, such as cardboard boxes for packaging.</i>
<i>Photograph cash box + any identifying features i.e. numbers on phone box – to show location of it to prove its that particular phone box.</i>
<i>Use gel lifts (speculatively) on the jack</i>



<i>Different angles of the graffiti, to show possible access points to the wall + features.</i>
<i>Try CCTV in the vicinity.</i>
<i>Control glass sample from the frame</i>
<i>However the things I initially thought I would need to be recover/look for was glass from POE and fingermarks (if any.)</i>
<i>I remember from the first job in &amp; this diary that I needed to concentrate my search on all aspects of the vehicle, glove box etc and not just the obvious ones, the POE etc.</i>
<i>Had there been no tool marks I would have looked more closely for fingermarks</i>
<i>Initially I considered the best powder to use on the extinguisher. I settled on usin bio-chro as it would provide best better contrast against the red and I prefer using that to aluminium which I find to messy</i>
<i>After discussing with (supervisor's name), next time I would f/p the lead with powder (black to contrast),</i>
<i>In the future I will be more aware of how bends can occur on garage doors in areas different from where the offender/s have actually bent or attempted to bend, by the help of (supervisor's name) mentoring me (i.e. piece of paper).</i>
<i>could have conducted fibre tapings to carpet in rear or truck.</i>
<i>however they are and it is so have opted to send for chemical treatment.</i>
<i>On reflection, I am going to discuss with (SOCO supervisor's name) whether anything can be obtained from the wick inside the bottle.</i>
<i>I should have considered the use of additional lighting.</i>
<i>Could have used gel lifts on the wing mirrors prior to performing a powder examination.</i>
<i>I note that I could also have used black powder instead of bi-chromatic.</i>
<i>I could also have gel lifted the boot area prior to performing fingerprint examination.</i>
<i>The items within the glove box were all powdered using magneta - this section of the examination was negative but I could also have used aluminium powder.</i>
<i>I should perhaps have examined the FNS door area also,</i>
<i>In hindsight I should have powdered the FNS door also as there was no reason that this may not have been opened.</i>
<i>I note that I could have used a gel on the truck sides</i>
<i>Gel could potentially have also been applied to the toolbox,</i>
<i>I could potentially have used aluminium powder instead of magneta</i>

The following comments are also crime scene practice related but are concerned with reaffirming practices previously adopted or provide reasoning why a course of action was implemented.

**Table 3.8 Reflection comments reaffirming practices or justification of practice**

<i>this was instead of casting the tool mark as it is always better to have the actual tool marks than a cast of them.</i>
<i>and settled for bi-cro as I felt this would give the best contrast and I prefer it to aluminium.</i>
<i>Good choice black gel for window</i>
<i>(Supervisor's name) was very impressed that I used a decontaminated surface (i.e. brown paper).</i>
<i>I proceeded to examine the tape sections with magneta which showed some smudges but overall was negative. Aluminium would have been unsuitable due to the rougher porous texture of the boxes.</i>
<i>but found previously that the Zephyr either over powders or the motion destroyed the marks sometimes. Lifted using clear lifts, could have used gel (black) lifts.</i>
<i>This is not something I would normally recover, especially as there had not been any arrests</i>
<i>Could possibly use scissors instead of scalpel to open plastic TE (Tamper Evident) bags.</i>
<i>Try not to 'flap' gel around after I've taken the backing off as could cause gel to crease.</i>
<i>Aluminium powder would not have shown up on this surface.</i>

The *Evaluation* theme is clearly comprehensive and complex. The content that makes up this theme is not only interconnected but also overarching in that it has the ability to impinge or perhaps explain the reason for other themes, notably *Analysis*.

### **3.3.5 Analysis**

*Analysis* as a theme has already to some degree been commented upon, as with other themes it is interwoven and often commingled with others. Coding whilst highly organised, systematic and consistent does suffer from not being able to explicitly divide a reflector's comments into one or a number

of categories. Instead a general theme or weight of comments suggests a proposed theme. *Analysis* comments can implicitly present an evaluation of the scene or artefact, as can *Evaluation* comments present on an implicit level an analysis of that object or crime scene; although it should be understood the two are different themes. Take for example the following statement “the texture on the door is just too rough”, at one level it is an analysis of the door’s surface construction but is equally an evaluation of the likelihood of the door being suitable for a fingerprint examination. Conversely a statement of “the chance of getting marks from that door are highly unlikely, any lifted would simply be broken up and fragmented” on one level presents an evaluation of the likelihood of forensic evidence but equally presents a quality statement on the fingerprints that have been lifted. Moreover it has also presented at a tacit, implicit level an understanding on the surface construction or condition of the door. It is for this reason that reflective comments discussed above have strong elements of some analysis of the surface of an object, environment or the sense made of information about a crime scene. An analysis is therefore inseparable from an evaluation of performance.

**Table 3.9 Reflection comments exploring the analysis of the surface to be examined**

<i>Had the garage door been smoother/painted with gloss paint and was completely smooth,</i>
<i>good reasoning for negative exam (i.e. type of surface of shed door).</i>
<i>concreted – no scope for f/w.</i>
<i>decided not to as surface was very worn + scratched.</i>
<i>it was too wet/soaking just damp enough to impede with my examination</i>
<i>I would not have used magneta as vehicle boot area would have contained metal.</i>
<i>I would have sent them both off for chemical without examination by use of powder however I felt the syrup inside was sealed to the box and could not be removed. The examination was negative.</i>
<i>2 x sections of cowling, both heavily textured on one side and very dusty on inside</i>

### **3.3.6 Interpretation and Reconstruction**

Analysis as a theme is followed by the sub-theme *Interpretation and Reconstruction*. The examiners reflected on the actions of the offender by either purposefully discussing these actions or to provide context of another point under discussion. For example, if evaluating the quality of fingerprints on a surface, then the location of these fingerprints was often included. These inclusions also suggest that the Volume Crime Scene Investigator has made an analysis from information or cues in the environment. This is clear when reference is made to the *Point of Entry* (POE) or similar.

**Table 3.10 Reflection comments presenting sub-theme Interpretation and Reconstruction**

lock damaged, allowing offenders to gain access
smashing the FNS Window, leaning in and access the contents of the glove box.
i.e. climbing over the gate, hedge etc.
photograph vehicle in situ + entry/exit route through fence
as I know the offenders have definitely handled this to remove the alloy wheels - especially the handle area,
The IP's garage door has been bent back and the offenders ...
The door to the IP's shed had been unscrewed from the hinges
In the future I will be more aware of how bends can occur on garage doors in areas different from where the offender/s have actually bent or attempted to bend, by the help of (supervisor's name) mentoring me (i.e. piece of paper).
If the doors were fully framed rather than "coupe" doors, I think this would have been intended as a bend back
I felt it was a bit unusual that the offender had done that rather than just break the lock as it would have taken more time.
the handle had been pulled off which damaged the lock enabling it to be opened.
in attempt to gain entry 3 of the four padlocks on the garage door had been removed
folding down door so the offenders must have left a trace on either o/s (outside) or i/s (inside) of door.
The side door to the IP's garage had been the POE
I targeted specific areas where offenders more likely to have touched e.g. ...
as offenders would of had to lean on rear door to remove tools.
Rear gate "kicked" in + shed door forced.
positive f/p exam of shed door + exam of petrol can that was moved.
Forced entry, tools, power washer + off road M/C taken.
been from this one so knew the offender had been i/s
because the window has been wound down so offender has touched the winder.
f/p all around pot as it could of been picked up at any angle - no obvious way of handling.
as the catch on the inside of the window had been disturbed.
and rear windscreen had been smashed with u/k item.
Had I been sure the offender had touched specific areas

POE through forced metal secure gate
and could ascertain from my visual that the fire had started at the rear of the kennel and then progressed forward
When I picked up the bottle to have a look, the bottle clearly had a wick inside that showed burn marks.
There was no smell of accelerant and the bottle was one previously containing alcohol.
boxes had had wires cut through.
Metal gates had been forced for entry into the yard and then both garage doors forced.
There was a possibility that offenders had touched the copper remaining
the cab section had not been entered by the offender.
tool box section had had the hasps forced on one side and the top had been bent back.
door open slightly so I presumed that entry to the front of the vehicle was via this method. In hindsight I should have powdered the FNS door also as there was no reason that this may not have been opened.
that I thought offender may have touched with negative result.

Analysis was not separate from other nodes, like evaluation and producing a strategy they were intertwined. The analysis reflections are the initial elements; they provide the justification for the evaluation. The fingerprint is of poor quality because the surface is textured or dirty, or the reason why no fingerprints or poor quality prints were recovered was because the scene or object was not preserved. *Analysis* statements were more than descriptions, behind these descriptions are interpretations not necessarily about the actions of the offender (this is a sub theme) but instead the structure or surface constructions. The captured descriptions in the reflections and later in the camera footage were not always recorded on the crime scene report form but nevertheless were pivotal in what was or was not examined or recovered.

The following Discussion chapter examines specifically objects or areas that are interpreted and connects this opinion-based interpretation aspect of the role with existing literature on the subject. Describing, Evaluating and Analysing became strong and robust categories. Moreover an understanding of investigator practice also emerges from these categories or themes.

Volume Crime Scene Investigators present in these reflections what is important to them whilst examining crime scenes. These same categories were equally placed to examine the video and audio data from the head camera recordings. Furthermore it became possible to triangulate data from the reflections with that found in the camera footage. Through the use of cluster analysis specific nodes or categories are presented as being related through interpreting the spatial plots.

Despite apologies from the examiners for not having the time in the working day to be able to write detailed narrative reflections, these series of bullet points and short paragraphs held rich data and were able to be coded and categorised in the same conventional way as interview or video data. It is also argued that the emergence of themes was more apparent at an earlier juncture due to the bullet point method of presenting reflections.

### **3.4 Explanation of the Physical and Verbal nodes.**

The following table presents the coding framework for the video data collected during the head camera study. This table explains the physical and cognitive actions performed by the examiners. These are defined as nodes which may be thought of as headings and it is under these nodes that examples of behaviour are categorised. These examples are referred to as coding references. The table provides explanation as to what these headings mean, that is to say what is meant when an examiner searches, or preserves or gel lifts a surface.

These nodes were constructed from the analysis of role profiles, themes that emerged from the literature review as well as material from the VCSI reflection and interviews. The earlier eye-tracker study also supported specific themes in the cognitive node category, for example *Strategy and Analysis*.

**Table 3.11 Presenting nodes and their corresponding explanation as derived from advertisements, literature and role profiles**

<b>Nodes</b>	<b>Description</b>
<b>Physical nodes</b>	
<b>Visual search/examination</b>	VCSI visually examines the scene or object either in a sweeping motion or focused on some specific area.
<b>Communication</b>	VCSI speaks with a wide range of individuals in particular other crime examiners, police officers or members of the public.
<b>Powdering</b>	VCSI examines surfaces with a wide range of fingerprint brushes or magnetic wands when searching for fingermarks or footwear marks.
<b>Resource selection/preparation</b>	VCSI selects resources from their own case or vehicle, and includes the preparation of locations for the deployment of equipment and techniques.
<b>Preserve/Recover/Package</b>	VCSI preserves, recovers or packages forensic evidence including articles requiring further examination or treatment.
<b>Gel &amp; lifting media</b>	VCSI applies gelatine lifter or other lifting media, used for the recovery of finger or footwear mark exhibits.
<b>Photography</b>	VCSI records the scene, specific objects or forensic evidence within the scene or recovered property.
<b>Documentation</b>	VCSI records details on scenes of crime form, packaging or labels.
<b>Identifies Forensic Evidence</b>	VCSI observes and comments on specific forensic evidence within the scene or the related object.
<b>Verbal nodes</b>	
<b>Analyse</b>	VCSI pays particular attention to the environment or object, often making specific statements concerning the impact of potential events or the makeup/surface construction of materials.
<b>Strategy</b>	VCSI states what planning or preparation is required to complete an action. Strategies may be overarching and broad or highly specific.
<b>Evaluate</b>	VCSI evaluates or grades the quality of the evidence recovered or likelihood of the quality related to the forensic evidence or material believed to have come into contact with the offender(s).
<b>Reconstruct</b>	VCSI make specific reference to the actions of the offender(s), detailing their movements in or around the crime scene or how they may have handled an object or appliance.
<b>Gathering information from sources</b>	VCSI obtains information from resources e.g. Radio/Mobile Communication with Control, printed crime documentation, as well as those present at the scene of the crime.



### 3.5 Head-mounted camera image quality.

Initial trials exploring field of view, varying light levels and close up observation of the head-mounted camera found both the PV500 and PV800 to be acceptable in all of these occasions.

Not all attempted scenes were successfully captured, twenty percent of files were either not fully recorded or became corrupted, these occurred largely early in the study and were resolved with employing strict recharging practice of the Digital Video Recorder battery and ensuring that the DVR was warm before use or not left in the crime scene vehicle overnight (the project was initiated in the winter months). Once these policies were implemented corrupted files were very much reduced. Image quality was not influenced by the use of fingerprint powders, jumping or walking, furthermore detail could still be observed in very low light levels.

The following series of images (Figure 3.10 to an including Figure 3.16) depict the light and activity in a variety of conditions.



**Figure 3.10** Photographic still image taken from recorded head-mounted footage of VCSI photographing a vehicle.



Figure 3.11 Photographic still taken from recorded head-mounted footage of VCSI securing seatbelt.

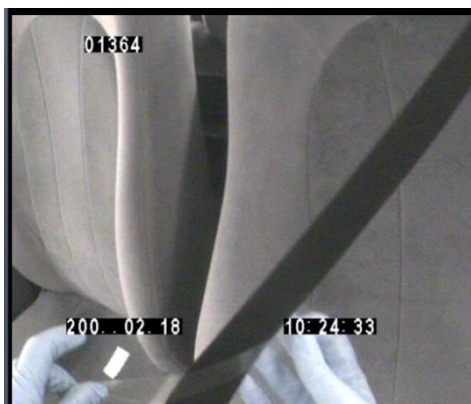


Figure 3.12 Photographic still taken from head-mounted footage of VCSI taping seatbelt.



Figure 3.13 Photographic still taken from head-mounted footage of VCSI examining evidence under a magnifier and light.



**Figure 3.14** Photographic still taken from head-mounted footage of VCSI examining an outbuilding.



**Figure 3.15** Photographic still taken from head-mounted footage of VCSI searching crime scene case.



**Figure 3.16** Photographic still taken from head-mounted footage of VCSI fingerprinting.

Recording the scene and speaking aloud did not appear to hinder or significantly alter practice, although it was recognised that extra time was

needed. Participant 1 commented that she liked it and others stated that after a short while wearing the device was no longer noticeable. Participant 1 was more precise in her feedback and explained that the process of slowing down helped, it took her out of 'auto pilot' and made her think more. Participant 2 picked up on this point and passed remark that it controlled the examination phase and helped to prevent omissions on her work. In essence speaking aloud became a memory jogger.

### **3.6 Robustness of Equipment and recording formats.**

The equipment lasted the seven month trial without either the camera, DVR or memory storage cards being damaged. The equipment was used in a variety of weather conditions and provided it was warmed prior to deployment it captured the scene sufficiently to observe practice including the use of fingerprint brushes and powders. Moreover the quality of the recordings was sufficient even after being converted from .avi (Audio Video Interleave) format to Windows Media Video format (wmv). This conversion allowed for a rapid response when fast forwarding and rewinding the recordings during the coding process, without the delay or lag for files exhibiting less compression.

### **3.7 Presentation and discussion of Dendrograms, Jaccard Coefficient Tables and Cluster Plots.**

The following charts and tree diagrams show the relationship between nodes based on their coding similarity after selecting for eight clusters for each participant. Clusters on the dendrograms are identified as they share the same colour and also will be on or close to the same tree stem as other nodes which share these coding references. At this juncture it is also necessary to be more detailed in the construction of these spatial plots before exploring their meaning.

Everitt (1974, p. 2-5) explores the term 'cluster analysis' explaining that it is a label afforded to a range of techniques that group data in what he calls "constituent groups". What is more interesting is that Everitt acknowledges that the term may be used to group objects or individuals as well as variables. Moreover many of these techniques are alternatives to factor analysis and principal component analysis. His work picks up on that of Ball (1971) by listing the reasons why cluster analysis should be useful; the seven themes cited include data reduction, data exploration and prediction based on groups. This description provides additional material to the backdrop for why grouping was chosen as a means of analysis.

SPSS (Statistical Package for Social Scientists) has long been able to perform complex data grouping statistical techniques such as factor analysis and principal component analysis, however these particular methods require certain variables to be *scale*. Data collected in the field study were not scale, instead they were nominal. As Everitt (1974, p.2-5) explains, cluster analysis is an extension or overarching definition which includes a myriad of techniques that group data. Grounded Theory pushes for data to be coded and grouped as it is a trusted way to make sense of complex material. This is a clear reason for using software to assist in this task. Since qualitative research has had a long tradition of grouping data is it evident and easy to understand how NVivo has evolved to now offer cluster analysis as a feature.

NVivo uses Jaccard's Coefficient to create the cluster analysis, Kaufman and Rousseeuw explain the purpose of Jaccard's Coefficient and its use in clustering asymmetric variables whereby 0-0 matches are not counted, allowing a cluster to be produced that concentrates on what coding references are related and consequently grouping them together in the spatial plot or dendrogram (p. 119 & p. 206). It is this Coefficient that NVivo 9 uses to perform clustering from the coding references.

Miller, Vandome and McBrewster (2009, p. 1) stress the importance in selecting the measurement distance. NVivo 9 allows the user to select the number of clusters, in essence the user is selecting the measurement

distance which will change the shape of any associated spatial plots as well as the number of clusters present in that plot. The clustering number for the following plots has been selected at 8 as this level of measurement is sufficient to identify clusters whilst still retaining confidence that the grouped nodes have a high degree of commonality.

### 3.8 Nodes clustered by coding similarity.

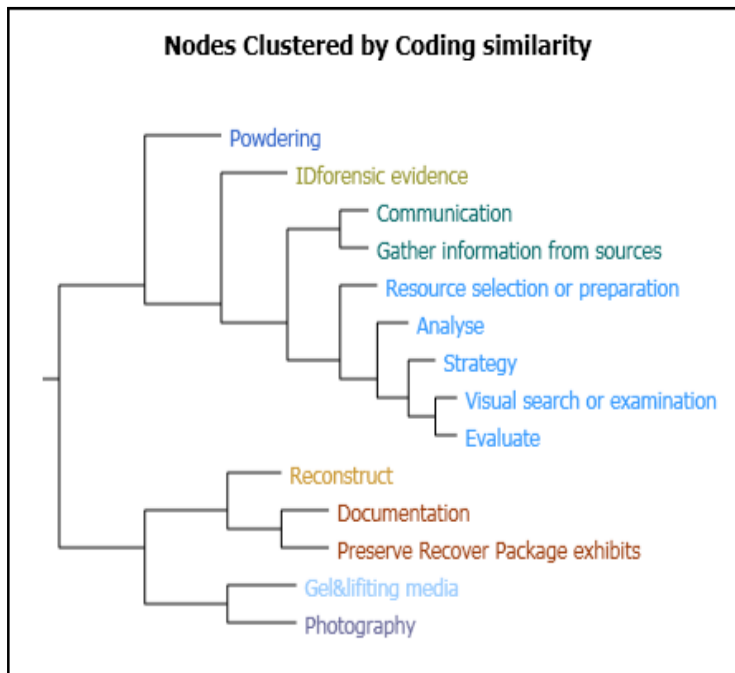


Figure 3.17 Dendrogram showing nodes clustered by coding similarity for Participant 1.

**Table 3.12 Showing clusters and associated strength of the Jaccard's Coefficient for Participant 1**

Node A	Node B	Jaccard's coefficient
Identifies forensic evidence	Fingerprint Powdering	0.272727
Identifies forensic evidence	Communication	0.4
<b>Gather information from sources</b>	<b>Communication</b>	<b>0.857143</b>
Gather information from sources	Resource selection or preparation	0.666667
<b>Analyse</b>	<b>Resource selection or preparation</b>	<b>0.75</b>
<b>Strategy</b>	<b>Analyse</b>	<b>0.823529</b>
<b>Strategy</b>	<b>Visual search or examination</b>	<b>0.9375</b>
<b>Evaluate</b>	<b>Visual search or examination</b>	<b>0.9375</b>
Interpret & Reconstruct	Documentation	0.555556
<b>Preserve Recover Package exhibits</b>	<b>Documentation</b>	<b>0.625</b>
Preserve Recover Package exhibits	Gel or other fingerprint lifting media	0.363636
Photography	Gel or other fingerprint lifting media	0.363636

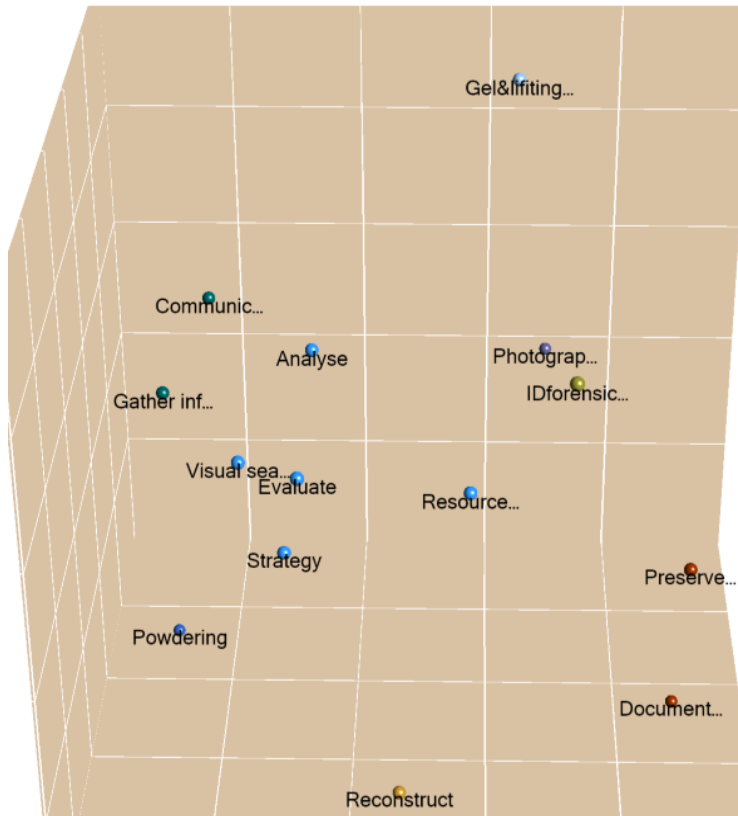


Figure 3.18 3 Dimensional spatial plot for nodes clustered by coding similarity for Participant 1

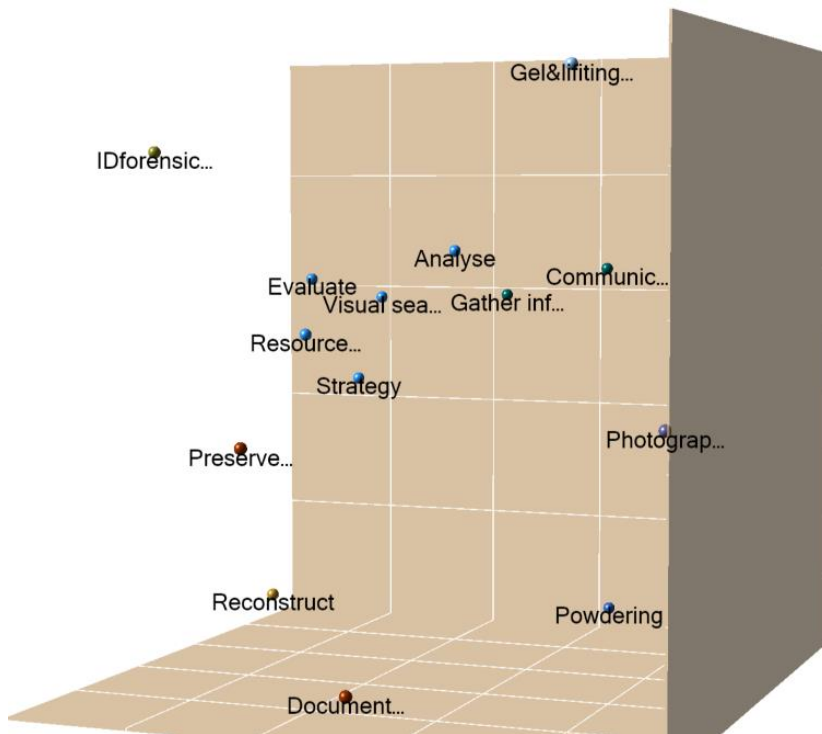


Figure 3.19 3 Dimensional spatial plot for nodes clustered by coding similarity for Participant 1 (rotated further in x plan to present nodes).



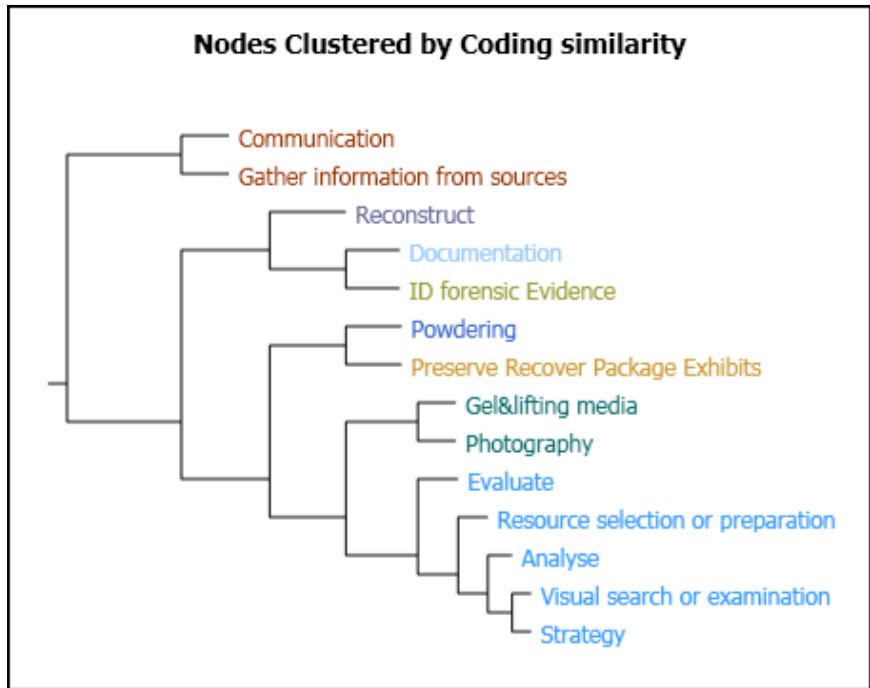


Figure 3.20 Dendrogram showing nodes clustered by coding similarity for Participant 2.

Table 3.13 Showing clusters and associated strength of the Jaccard's Coefficient for Participant 2.

Node A	Node B	Jaccard's coefficient
<b>Gather information from sources</b>	<b>Communication</b>	<b>0.7</b>
Reconstruct	Documentation	0.4
ID forensic Evidence	Documentation	0.636364
Reconstruct	ID forensic Evidence	0.555556
Preserve Recover Package Exhibits	Powdering	0.615385
<b>Photography</b>	<b>Gel &amp; lifting media</b>	<b>0.8</b>
<b>Resource selection or preparation</b>	<b>Evaluate</b>	<b>0.777778</b>
<b>Resource selection or preparation</b>	<b>Analyse</b>	<b>0.888889</b>
<b>Analyse</b>	<b>Visual search or examination</b>	<b>0.944444</b>
<b>Strategy</b>	<b>Visual search or examination</b>	<b>1</b>

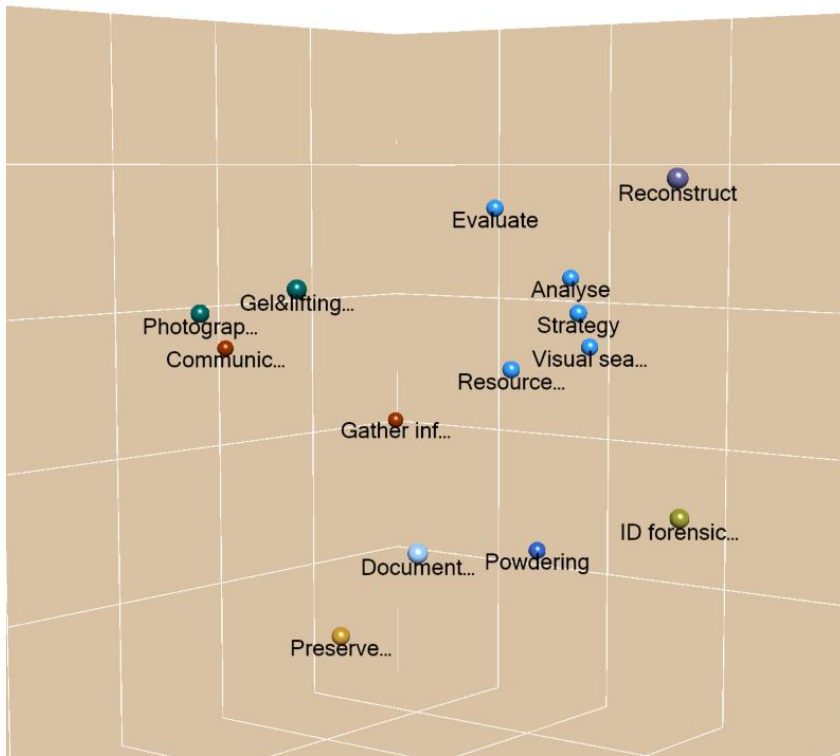


Figure 3.21 3 Dimensional spatial plot showing nodes clustered by coding similarity for Participant 2.

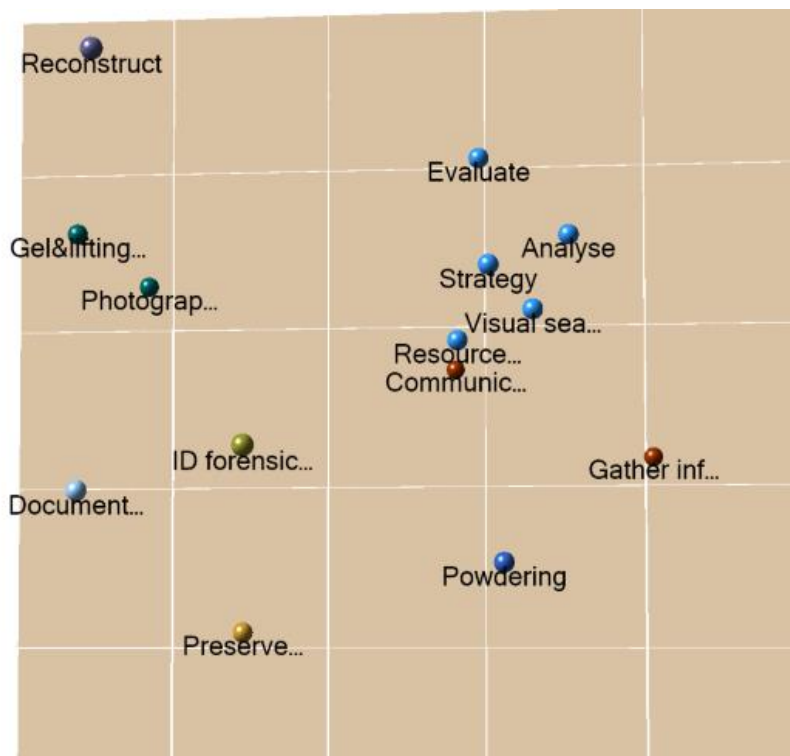


Figure 3.22 3 Dimensional spatial plot showing nodes clustered by coding similarity for Participant 2 (rotated further in x plan to present nodes).

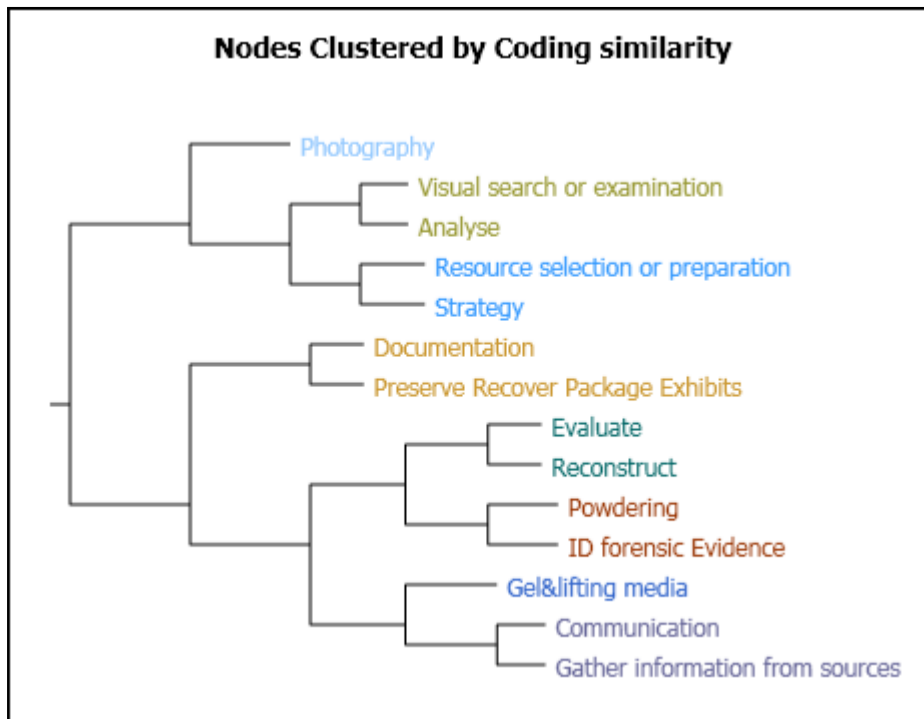


Figure 3.23 Dendrogram of nodes clustered by coding similarity for Participant 3.

Table 3.14 Showing clustered and associated strength of the Jaccard's Coefficient for Participant 3.

Node A	Node B	Jaccard's coefficient
Photography	Visual search or examination	0.352941
<b>Analyse</b>	<b>Visual search or examination</b>	<b>0.722222</b>
<b>Strategy</b>	<b>Resource selection or preparation</b>	<b>0.555556</b>
<b>Preserve Recover Package Exhibits</b>	<b>Documentation</b>	<b>0.666667</b>
<b>Reconstruct</b>	<b>Evaluate</b>	<b>0.666667</b>
<b>ID forensic Evidence</b>	<b>Powdering</b>	<b>0.5</b>
Gel & lifting media	Communication	0.285714
<b>Gather information from sources</b>	<b>Communication</b>	<b>0.714286</b>

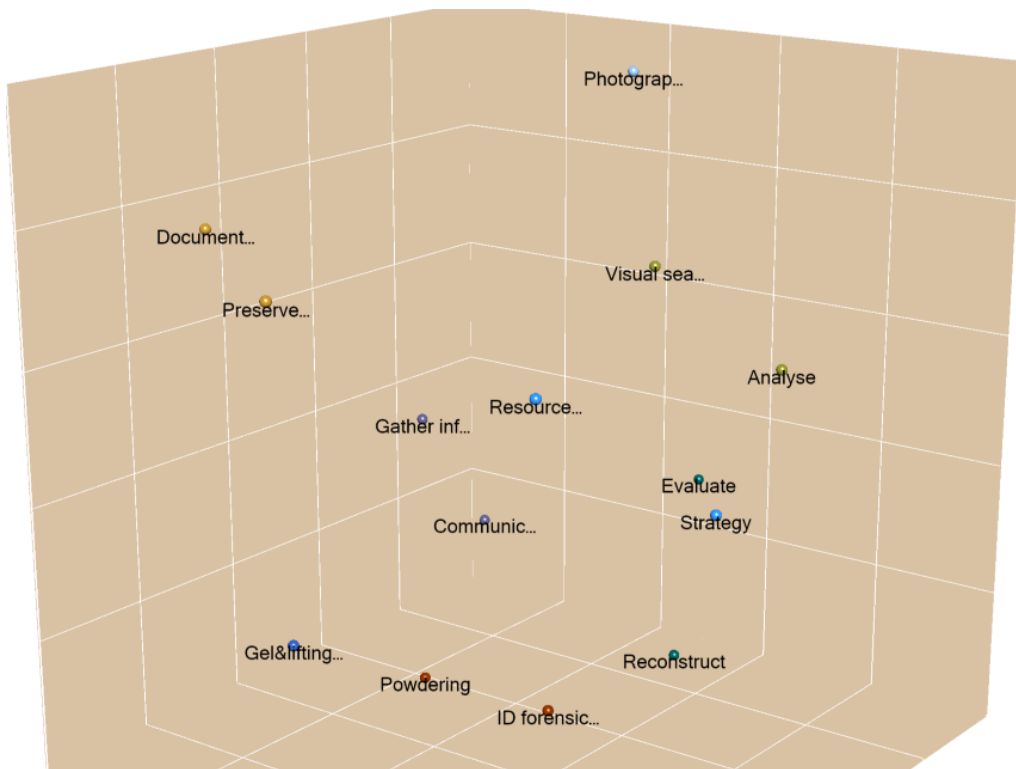


Figure 3.24 3 Dimensional spatial plot for nodes clustered by similarity for Participant 3.

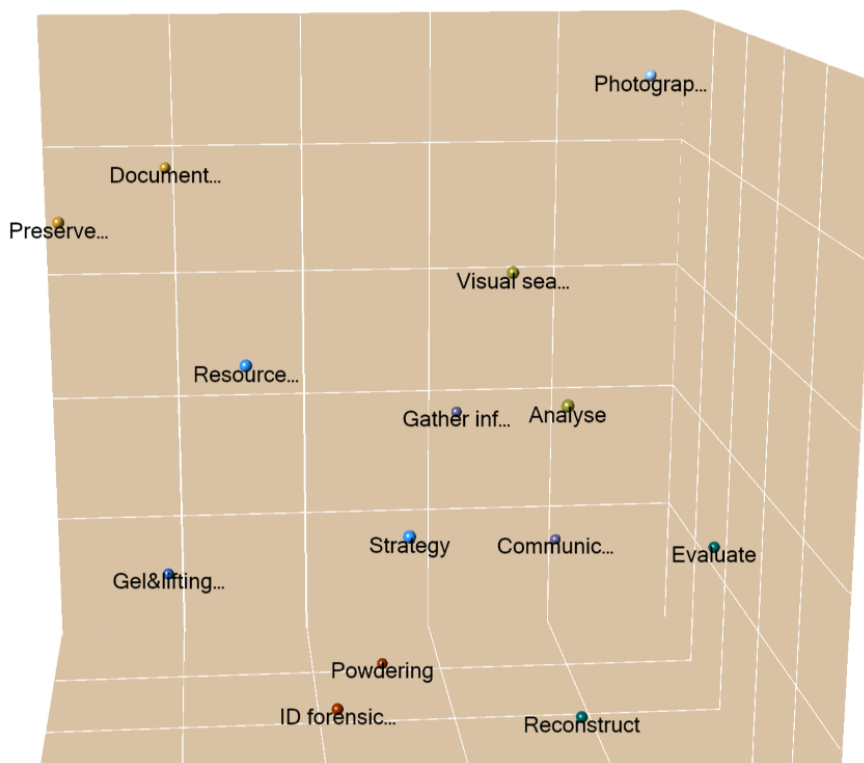


Figure 3.25 3 Dimensional spatial plot for nodes clustered by similarity for Participant 3 (rotated further in x plan to present nodes).

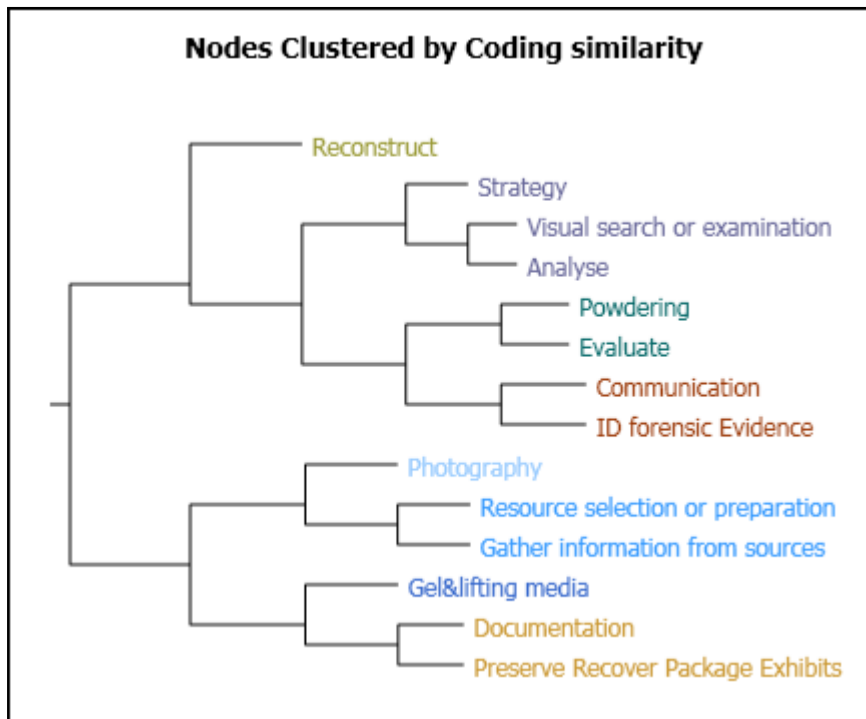


Figure 3.26 Dendrogram for nodes clustered by coding for Participant 4.

Table 3.15 Showing clustered and associated strength of the Jaccard's Coefficient for Participant 4.

Node A	Node B	Jaccard's coefficient
Reconstruct	Strategy	0.15
<b>Strategy</b>	<b>Visual search or examination</b>	<b>0.580645</b>
<b>Analyse</b>	<b>Visual search or examination</b>	<b>0.709677</b>
<b>Strategy</b>	<b>Analyse</b>	<b>0.666667</b>
<b>Evaluate</b>	<b>Powdering</b>	<b>0.52</b>
<b>ID forensic Evidence</b>	<b>Communication</b>	<b>0.35</b>
Photography	Resource selection or preparation	0.277778
<b>Gather information from sources</b>	<b>Resource selection or preparation</b>	<b>0.47619</b>
Documentation	Gel & lifting media	0.285714
<b>Preserve Recover Package Exhibits</b>	<b>Documentation</b>	<b>0.545455</b>

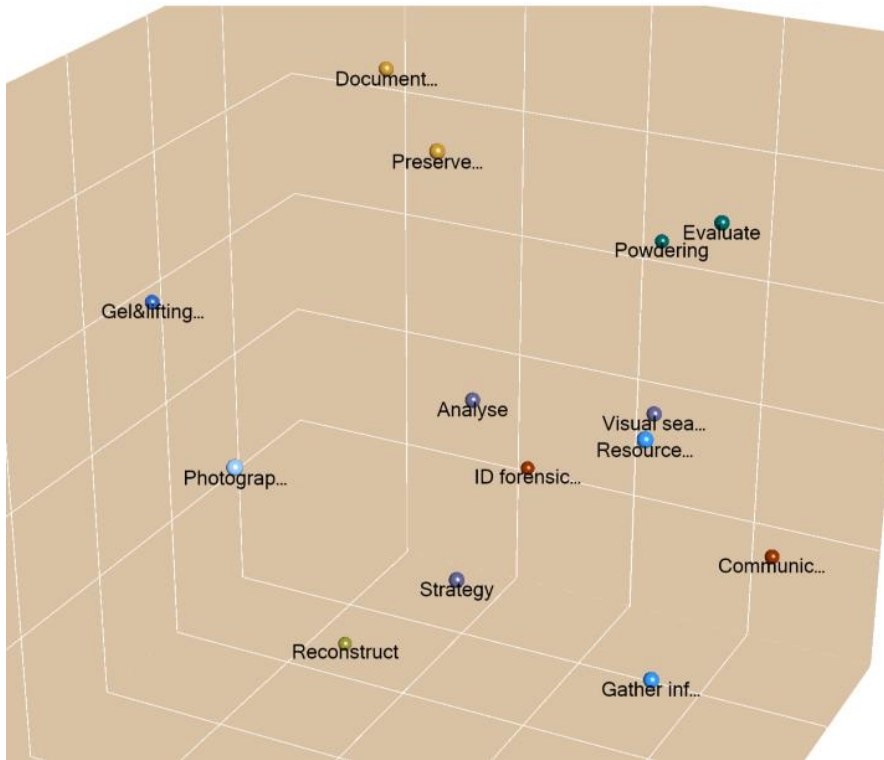


Figure 3.27 3 Dimensional spatial plot for nodes clustered by similarity for Participant 4.

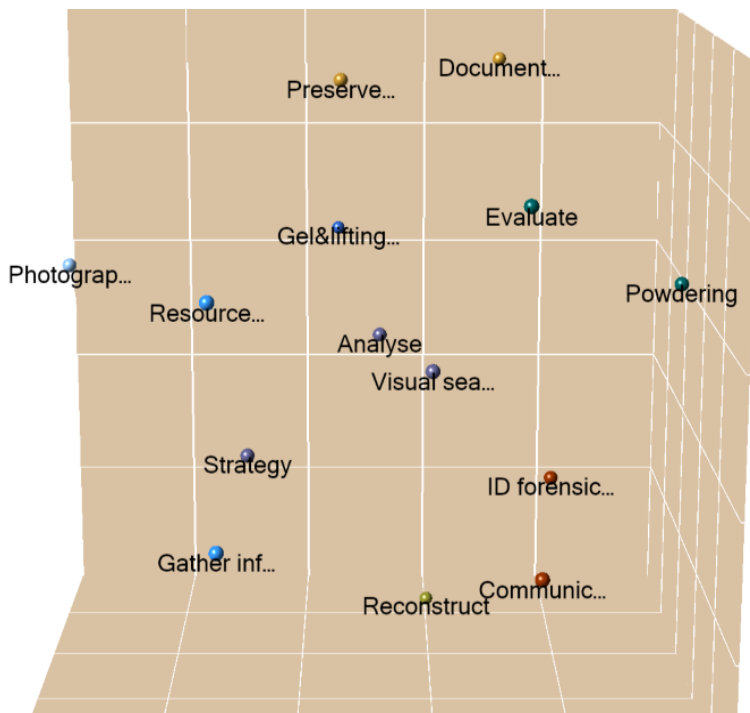


Figure 3.28 Dimensional spatial plot for nodes clustered by similarity for Participant 4 (rotated further in x plan to present nodes).

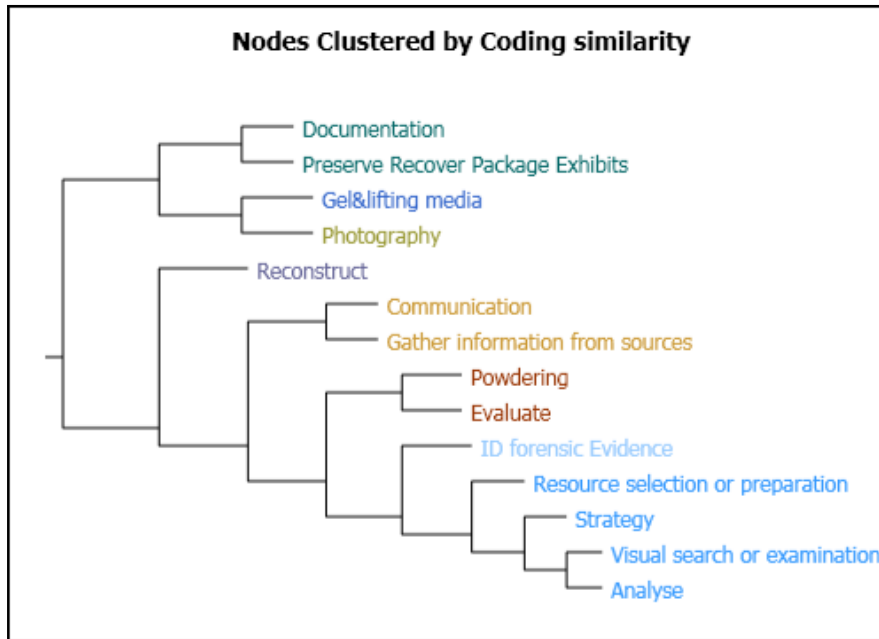


Figure 3.29 Dendrogram showing nodes clustered by coding similarity for all 4 participants.

Table 3.16 Showing clustered and associated strength of the Jaccard's Coefficient for all 4 participants.

Node A	Node B	Jaccard's coefficient
Preserve Recover Package Exhibits	Documentation	0.615385
Photography	Gel & lifting media	0.394737
Reconstruct	Communication	0.26
Gather information from sources	Communication	0.615385
Evaluate	Powdering	0.52381
ID forensic Evidence	Resource selection or preparation	0.411765
Strategy	Resource selection or preparation	0.69863
Strategy	Visual search or examination	0.72619
Analyse	Visual search or examination	0.797619

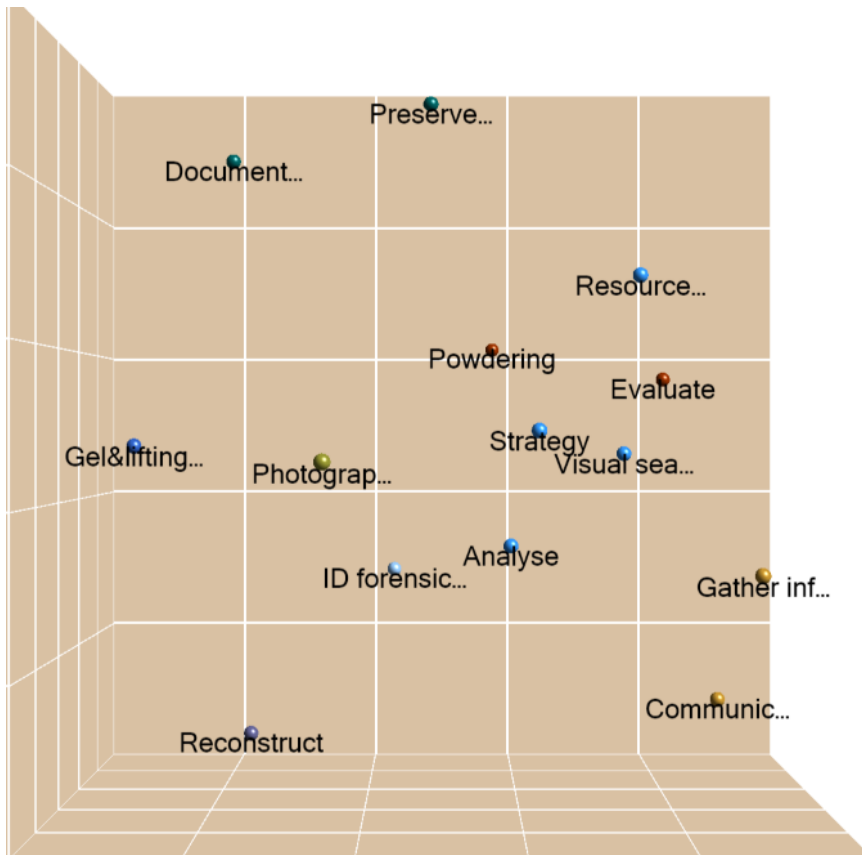


Figure 3.30 3 Dimensional spatial plot showing nodes clustered for all 4 participants.

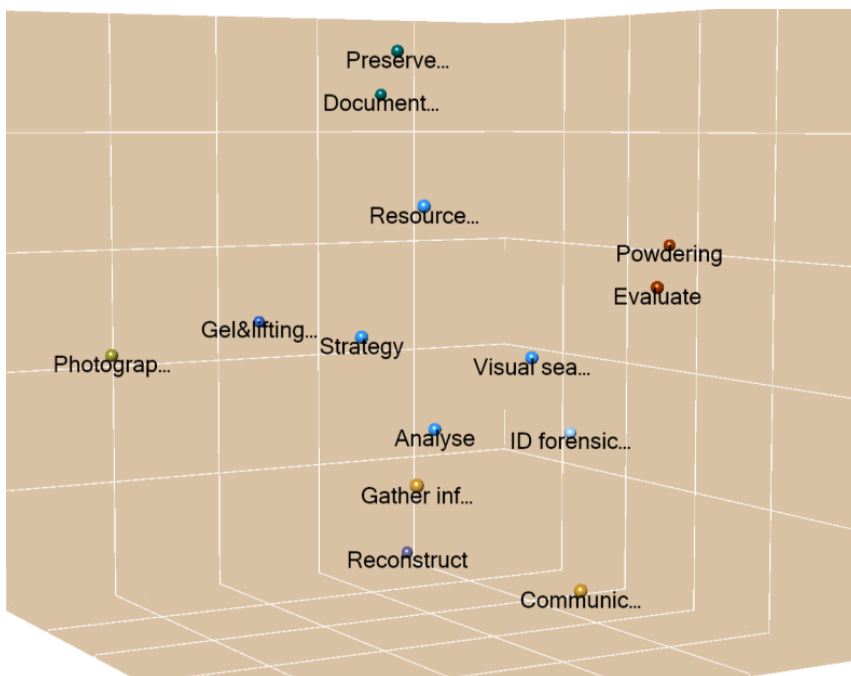


Figure 3.31 3 Dimensional spatial plots showing nodes clustered for all 4 participants (rotated further in x plan to present nodes).



The following chart examines the data collected in the crime scene report form to that obtained using the head-mounted camera and verbal report. In simple terms its intended aim was to explore the potential of missing intelligence recognised at the crime scene and commented upon as speech but not conveyed on the report form. Intelligence was categorised into three groups: Modus Operandi, Background Intelligence and Evidence. There were 47 instances of intelligence recognised at the crime scene by the examiner but not recorded on the scenes of crime form.

### 3.9 Frequency counts of intelligence not included in the Tech 5 Scenes of Crime Report Form.

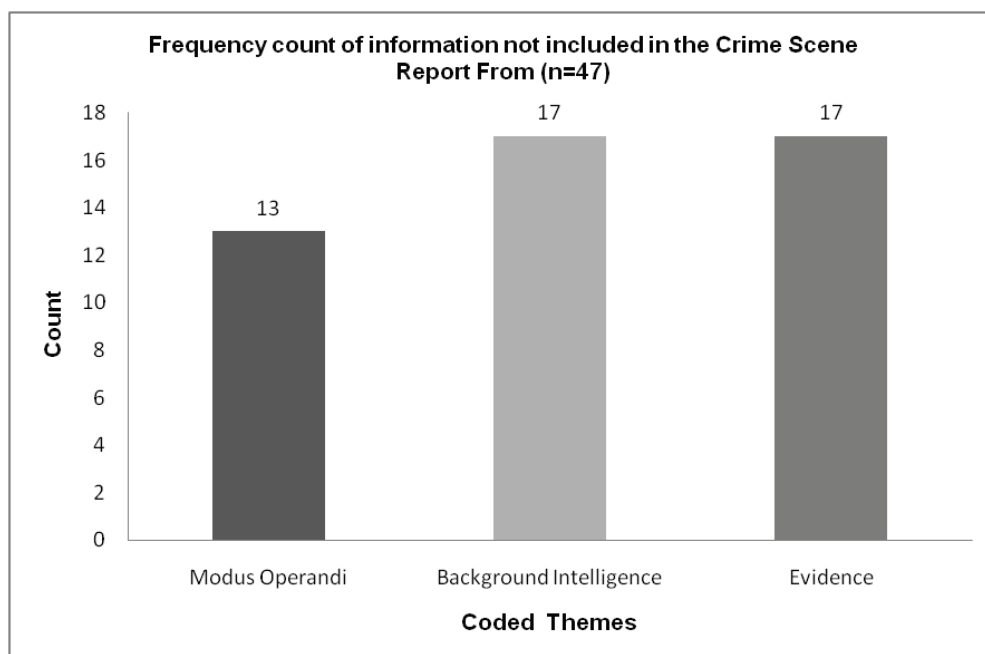


Figure 3.32 Showing frequency counts of intelligence not included in the Tech 5 Scenes of Crime Report Form.

### 3.10 Interview transcripts: What makes a VCSI?

The following themes were uncovered from the interviews as well as observations of participants whilst at the police station doing routine work. Their significance is that they broaden the initial view of what a VCSI does in relation to her work. The themes discussed explain the VCSIs' perceptions of themselves and what they believe others think of them, perhaps more importantly than this is that these themes provide context to the working practices carried out in the field. These themes flesh out and explain what behaviours or actions are associated with each other and the value placed on examining scenes in a particular format. Some of these themes are more abstract in their setting; they provide an insight into personalities and different ontological positions with respect to crime types and how VCSIs see themselves.

#### 3.10.1 Theme: Sense of Identity

The following transcripts explore *identity* in terms of being valued as a role or resource, as well as the title of the role from a phenomenological perspective incorporating police and public perceptions. It should also be stated at this juncture that *Pride* was constructed as a separate node, in essence a theme in its own right, however it was not uncommon for participants to give an account of an event or some aspect of their work and speak with pride during this telling. This came across when explaining their role or title as well as their working practices. The meaning and implications of these accounts is discussed in more detail in the following chapter.

Participant 4 discusses her preference for the role title of CSI (Crime Scene Investigator). This is historic with its origins going back to her previous police employer, however there is more to be understood from this preference. The title is different to her Scenes of Crime colleagues; there is a willingness or desire for others outside the police organisation to understand what she does as an occupation. She is proud of her job and the response she receives when members of the public comment on popular television dramas. She states that other colleagues are more reserved about openly disclosing their occupation however she does not share this.

On an aside it may be argued that training and the real world are different; certainly this is reported as being true for Crime Scene Investigation, notably with research into the CSI effect exploring jury views (Schweitzer and Saks, 2007, Stevens, 2008, Tyler, 2006). A real world perspective was sort from this VCSI as to whether the role lived up to her expectations. This VCSI was gently pushed on this issue to provide rich description as Participant 2 and other VCSIs had commented on the crime types they attend and the view that VCSIs attend lower class crime. Here the VCSI (participant 4) draws a distinction with other forensic work and presents her own perspective on what that must be like, before deciding that her job gives her a sense of freedom, responsibility and trust. She stated that real world work was better than the simulated scenes completed in her higher education training experience as there was more tolerance in the real world.

This VCSI went further in explaining her role through a case history of an elderly female that had been attacked. Participant 4 put the attack in context and put across her assessment of what the offender's motive might have been and in this instance the VCSI believed there was no sexual element. The consequences of this was profound

*VCSI: She said oh you've proper put me to rest, she said I thought he was going to rape me*

The VCSI believed it was her role to assess and to reassure this elderly female, even though her instruction was to simply carry out a forensic examination of the coat she (elderly female) was wearing on the day of the attack. Moreover the VCSI spoke with pride about this particular event, a theme that emerged in the coding and is very much connected with having a sense of identity. This is important to appreciate, since key performance metrics would not capture this aspect of work. Moreover National Occupational Standards are hard to interpret and map across, in order to cover an example such as this. The reported effect from the perspective of the victim was nevertheless profound.

The issue of a uniform was raised with participant 1, the notion that a uniform being a physical object displaying identity was commented upon by other VCSIs. Whilst participant 1 stated that she was not concerned about a uniform; it is interesting to note that the clothing she decided to adopt prior to her uniform being issued was the same albeit without the police branding and badges. The topic of identity also had legal as well as health and well-being issues with the role being clearly defined unequivocally through a uniform. The moment VCSIs arrive to examine a scene or meet a member of the public their identity is believed to be important and should be clear and distinctly different from 'police staff'.

*VCSI: No I think, I think it's better 'cos obviously when you knocking on somebody's door, it looks more professional so they can sort of see who you are and police staff, I mean anything from the gardener to the caretakers so ....*

### **3.10.2 Theme: Experimenting with resources**

This section details the comments from the VCSIs in relation to experimenting with resources, most commonly with fingerprint powders and techniques. The comments from the interviewees addressed where this experimentation occurred and also the consequences for the crime scene examination. This section is also closely associated with comments relating to the theme Working Practices and why particular actions are implemented. This theme has remained a standalone node as its link to *practitioner development* was important to capture moreover its connection with *Sharing Awareness* and *Tacit Knowledge* was also strong.

Participant 1 discussed her learning about different techniques when she first started as a VCSI. The interview began by going through the introduction period which was brief and focussed on generic factors anyone joining this particular police force would need to learn. Mentoring was limited to a few days however this mentoring time came across as being important and valued.

Participant 1 highlighted that at the time of the interview she was still 'playing' and 'experimenting' with powders. She had an understanding of what

powders can be used but there is a strong element for personal preference. The materials commented upon are different to those she had experience of in a simulated training environment. This participant purposefully sort out how other more experienced practitioners engaged with powders and the associated fingerprinting techniques at a crime scene. There was a sense of checking and testing her knowledge and skill before settling into her own practice. This was a deviation away from how fingerprint examination and enhancement was taught in her higher education institution, suggesting a desire to be socialised into her new practice.

*VCSI: ...at uni, we always got sort of taught to use separate brushes in a swirly motion, erm here they quite usually just use the squirrel brushes in just a stroking motion.*

Interesting there is no judgement passed by her fellow practitioners on why specific techniques hold favour. The examiner when asked about differences between the real world and her simulated experiences chose to provide examples not on practice itself but instead on the condition of the environment. Here she comments on surfaces being damp and so needed to have the knowledge and skill to change her technique and fingerprint powder brush combination. In addition there was a sense of findings ones feet, exploring and experimenting with different powder and brush combinations to decide what feels comfortable or intuitive.

*VCSI: Yeah a bit of both, 'cos I'm still sort of playing a bit with the powders and things and finding out which I like best*

*VCSI: Erm, it's, it consists of ali powder and black powder, it's like both so it's black in appearance but it, I just, I find that I get quite good results from it*

*VCSI: Erm, I'd use it on sort of smooth surfaces...I find it's quite good on erm metal garage doors...*

*VCSI: ..., I'm just finding myself experimenting with the different powders and brushes at the minute to see which ones are the most effective 'cos you don't, you don't really know until you've actually tried them yourself do ya so*

This is interesting in that in that the reasons or drive for experimenting is with in herself and is also suggested by her supervisor.

*VCSI: Well, (name) the SOCO supervisor, he, he, when we first started, he actually said if you do **get some quiet time go and experiment with the camera, with the brushes, but I just like to do it for myself really***

There is also evidence that this experimentation has value amongst her peers and that each practitioner recognises that slight variations are apparent in others.

*VCSI: ... Like I know, I know (participant 4) likes the erm, I know (participant 4) like the flake powder that she likes a lot and I know she doesn't like the black powder but, I, I like the black powder. It's just your own preference really*

Furthermore the forensic laboratory at the place of work is an environment where this practising takes place; here the examiners are using a simulated environment to practise and experiment for the real world. Evidence is presented that this is not an individual led practice but is apparent amongst all the participants.

*VCSI: Well it's just like obviously the cups and things that are already in the lab anyway, **just play about** with those and then just find out which ones are more effective than the others. The same as the fingerprint lifters as well*

*VCSI: Like, **I've started, experimenting** with a lot of those, 'cos I know, I tend, when I first started, I tended to stick to one particular lift and I don't know why, but I've actually seem to be experimenting and playing about, I've now found another one that I like better*

INT: So what did you, what did you use to start and what did you use at the end?

*VCSI: At the start, I used erm there were, I can't remember what they're called, they're in a box and they've got black writing on the side, I think they're called easy tabs or something they call them*

*VCSI: ... I found that I like the ones in the booklet with the white strip on, I found that I like those much more 'cos the easy tabs tend to, when you're pulling them off the surface, they tend, I find, they tend to like jump so they don't pick up all the prints I don't think, whereas the other ones seem to come off in a smoother fashion...**but I know speaking to some of the others that they like the easy tabs better** so it's just.*

INT: In a booklet right, I'll have to a have a look at those. Do other people experiment?

*VCSI: I know that (SOCO name) does, I think (participant 3) does, yeah I think they all do. I know (participant 4) does when we first started; (participant 4) did with the camera and things, 'cos she actually wrote us a sheet out on how to use the camera and things.*

Participant 1 explained a moment when she experimented with photography whilst at a crime scene. The VCSI explained that there are times when photography is used to present a record of the scene, there are also times when a record needs to be shown of a specific object or injury. The scrutiny of such images and their ability to illustrate the consequences of a criminal act are significant. Participant 1 presents a case history when she was not getting the best result from her photographic techniques in the moment.

*VCSI: I was actually taking some injury photos and it was, a lad had been punched in the face and it was his lip and I was trying to take these photos for ages ... Anyway's so I was taking photos of this lads face and I kept like looking in the view finder to see what they were like and they were just crap. So I like played about and put it on manual erm, and there is a sign on the back of the lab door actually of what settings to use, so I just sort of had a look at them and erm and I always carry the, the sheet that (name of participant 4) did for us in my case and I just loaded all my settings onto that and took them and they were like really, really good. And I'm glad I did it as well 'cos I, I had to produce a photo album with them in as well*

INT: For court?

*VCSI: Yeah, so like, so I've tended to stick to that now, especially when doing injury photos*

Whilst the examiner also complains about the quality of the technology she had at her disposal there was nevertheless an about turn in the quality of her images from simply following a set of guidelines.

Participant 4 explains the unusual nature of where the origins of experimentation lie. It was not uncommon for other participants to comment on chance interactions with other practitioners in the police laboratory however this particular account shows the varied and dynamic nature of what stimulates *experimentation* with a desire to improve investigator practice or perhaps make it easier and more manageable.

Participant 4 not only explains how new knowledge came to being but also divulged what her preferences were: open and fluid with certain brush and powder combinations but more focused and certain about others. Moreover she provided detailed description as to why she likes certain fingerprint powder application methods and who introduced her to this new form of practice. This change came as a result of off duty discussions about what works best along with the strength of what the examiner wants when examining a scene even if this is in contradiction to what another examiner

prefers.

*VCSI: In Joe Rigatonis, we were having tea one night, I don't know we were discussing some case or other and she was like well try it, 'cos it just goes on*

*VCSI: No, no she just said put it in, tap it off, put it on and it just brings the mark up, so I thought oh ok I'll give it a go, but (another SOCO) was still adamant she wasn't, but I'm quite open and I, if it's going to make your job easier, what I love, so*

*VCSI: No I tried it in a lab first, I had a lot of issues with erm, when I started here 'cos (former Police Employer) don't use bio-chromatic powder, I don't know if you've tries using bio-chromatic*

*VCSI: I don't have a set method that I would use every single time, the only method that I prefer is my magneta wand with my erm magneta, I like a thin wand and they don't have them here, I luckily inherited a couple from (name of previous police employer) but I don't like the big ones, I find that it drops loads of magneta and they're not nice to use but (name of SOCO supervisor) prefers the big ones, he says they're easier but I'm like well I like the little ones 'cos you can't hold as much on it 'cos the magnet is smaller inside so you can't spill as much so it's less mess for a start so like you don't want to be dropping magneta all over somebody's carpet erm*

*INT: So maybe you and (SOCO supervisor's name) use magneta in different environments*

*VCSI: Yeah I mean (name of SOCO supervisor), to be fair, he showed me that magneta can be used for fingerprinting on paper and I would have never thought to use it on paper but it really brings up the marks as long as it's fresh*

*VCSI: I'll go over any marks that I can see just dead lightly with the squirrel, brush the excess off so I can lift it properly*

*INT: And is that something you've picked up here or in a previous?*

*VCSI: (name of previous employer)*

With further evidence of examiners having a preference

*VCSI: erm and I actually interject and asked do you always use the white lifters erm and she said that was her personal preference, those white strips and I've come to like the ones, the longer, the longer ones with the, we've got a black edge to them.*

It is apparent that *experimenting* as a theme may have a stimulus and this stimulus being derived from passing on or sharing knowledge, which in turn brings on experimentation. As a consequence the following theme emerged simultaneously during the coding phase and whilst presented here as distinct, the boundaries are interrelated and interconnected. Drawing on from the literature on this subject the following theme has been labelled as 'Sharing Awareness and Tacit Knowledge'. This particular theme is



populated with exemplars and provides contextual material for this particular domain. As stated the above theme already presented comments that explain how through interactions with others new and different practices have emerged, however these examples were specific to experimentation. The following theme is richer, but does not always have experimentation as a basis for developing practice. That said *reflection* is evident in many of the occurrences, either as a mechanism to construct new with existing knowledge or to mimic and embed in the reflector's own practice.

### **3.10.3 Theme: Sharing Awareness and Tacit Knowledge**

Participant 1 begins by explaining how she had been out and observed other practitioners and what she had learned from the observations of others. It was elicited from participant 1 that some of these knowledge sharing occurrences are by chance, whilst engaged in other activities. After careful questioning, participant 1 commits to what specifically she had learnt, in this instance questioning an injured party often referred to as an IP. This particular example connects with the spatial plots earlier as they show for all participants the close relationship between the injured party and VCSI in gaining and transmitting information. Some of these learning exchanges happened spontaneously with no planning, in other cases knowledge was sort out. Other examples were from experienced practitioners, who recognised learning opportunities in less experienced staff and so offered the learning to these developing practitioners.

*VCSI: ...Or if like, we're doing something in the lab and one of the SOCOs will happen to come in, they'll maybe like say oh you might be better doing it like this or so a bit of*

*VCSI: Yeah, erm I quite, obviously I got quite friendly with (mentor), 'cos, even though I was only with her for two days, like she's a SOCO here now, so erm if she knows I'm on my own, she'll quite often radio me and say I've got a burglary, do you want to come with me, so like I'll quite gladly go*

*VCSI: Erm just erm, sort of writing up your notes better, talking to the IP's erm, just tech, techniques in general*

Other examples relate to practitioners also having a preference for certain powders or lifting tape. Some of these preferences are through a real dislike for one kind of powder. Participant 2 stated she “hated” aluminium and much preferred bio-chromatic powder as its consistency was much more like granular powder as well as citing additional health benefits. The heavier weighting of bio-chromatic powder made it less likely of it being breathed in although as a material it was dirtier to work with. Examples also related to practitioners preferring certain fingerprint lifting media, sticky tabs from a booklet were also stated as being preferable to rolled tape. These variations are important to consider, this window into investigator practice identifies that whilst there are common methods that are adopted. There is also wide variation at the micro level during these examinations.

These examples of learning are not just about the physical examination but also include the recording of information, the time it takes to manage ones time better, is a marker in being a more efficient and effective examiner.

INT: You say writing up your notes...is there something that she puts in, something that she leaves out, the way she constructs it

VCSI: *Erm, probably a bit of everything really. 'Cos I write my notes and it takes me about four hours to write a crime scene note*

VCSI: *I think I do yeah. I mean I was thinking the other day, I was thinking god I'm going to have to like cut these notes down 'cos it's taking like, it's doubling my workload to be honest...*

Although this is her feeling there is still the sense that writing detailed notes is important and without them:

*“Like how could you possibly remember what that, what that looked like if you didn't,*

The mentor also assisted development in other ways, for example the soft skills needed for interviewing, imparting information or the result of the examination. The example below captures reflection and centres on the perspective of the householder, whilst understanding the limits to their knowledge.

VCSI: *oh I don't know what to say to them, do you know what I mean, but like after I've been out with (mentor's name) sort of I'm, I'm a lot more confident and sort of like know what to say to them and sort of like so they understand, do you know what*

*I mean 'cos if like you go and say oh I've taken a gel lift from this, that, they're not going to have a bloody clue what you're on about ...*

*VCSI: So like, just like how to simplify things into layman's terms I suppose*

In addition dealing with the injured party or house holder and explaining to them that no forensic evidence was obtained was difficult and needed careful management. VCSIs wanted to still offer hope and reassurance.

Participant 1 gives an account of watching the video recordings of other practitioners, she described this as a 'sneaky peek' and initially explained that her viewing of other videos was to see if her usage of the camera equipment was correct, however there was another motive as well that surfaced. This motive was also to learn from another practitioner, observing their styles and performance, moreover it generated conversation with her mentor. Participant 1 was insecure about her use of the head-mounted camera however she was intrigued by how her peers examined crime scenes. This account provided another example of how knowledge is transmitted and in this instance it was transmitted through the use of the research tool to observe practice. This was a critical point in this research and so was incorporated into the recommendation section. Moreover it opened future opportunities for how practitioner development could be steered. Presented below is evidence that recorded crime scenes from the point of view of the examiner, has the potential to generate material for others to learn from. Each participant was open to allowing others to view their video recordings; the following account provides an interesting and powerful example of how knowledge can be shared. The participant was asked why she looked at the other practitioners recording, she suggested initially it was to see if she was wearing and operating the equipment properly, however when pressed other reasons for this viewing became clear.

*VCSI: Yeah, but I must admit when I did watch them, I, I was watching what they did as well*

*(9 second pause)*

*VCSI: ... just to see what, what they were doing like a good example was, that I was watching erm one of (name of participant 2) and she was out with (name of participant 4) and 'cos (participant 4) uses the flake powder like a hell of a lot she*

*loves it, do you know what I mean and (participant 2) was using this flake powder on a shed door. And she was like putting it on, like as you do, but then she got her brush and was just painting like over it and I, 'cos I've actually spoke to (mentor) about it later on, I didn't say that I'd seen (participant 2) or anything, but I just said like I've seen somebody do that, is that like, I've never seen anybody do that before*

*VCSI: Not that (mentor's name), well (mentor's name) just say oh well I haven't either*

*INT: She didn't go, that's not right, that's wrong?*

*VCSI: No, no, no 'cos it, you know, it's juts everyone does things different...*

Participant 1 continues with examples where knowledge has been shared, these are often through chance meetings and encounters with more experienced staff. The example described focused on the storage of wet blood samples, however the remark suggested that the flow of knowledge was not necessarily centred on one topic. The sharing of knowledge is therefore not specific to one area of crime scene work, but incorporates many different facets. What is apparent and interesting is that the laboratory within the police station became a hub for the transmission of knowledge. Chapter 4 will argue that certain nodes make more likely the opportunity for tacit knowledge to be shared and learning to take place.

*VCSI: ... we, we had a conversation yesterday about erm like how would you store a wet blood stained item and I said like in a paper bag but (participant 3) was like no you put it in a poly bag in a paper bag. So we were having this debate and at that point (mentor's name) and (a SOCOs name) the SOCO came in and we asked them in there*

*VCSI: Well they came into the lab and I was like oh (mentor's name), can I ask you something, do you know what I mean, and then we told her and they corrected us like told us...*

The following transcriptions are again from Participant 1, specific to watching the head-mounted camera video recordings; they relate to a time when her and her supervisor sat down and watched one of the early crime scene examinations she carried out. The interview exposed that new knowledge was constructed from this event. Moreover it was information that was not written down in the scenes of crime report form. The interview begins by asking the VCSI what advice or pointers the supervisor gave her if any.

VCSI: *Erm, one of them was, you know the first scene erm you know where they've climbed through the fence?*

VCSI: *He said that I should have taken erm like cuttings from the fence*

INT: To match with instruments?

VCSI: *Yeah, which I didn't know and I know I've spoken to erm (participant 3) and (participant 4) and they didn't know either*

*(7 second pause)*

INT: Hmm, if (SOCO supervisor) hadn't have seen your video, he didn't go out with you for the day or anything like that

VCSI: *No, no I was on my own*

INT: You would've missed that,...

VCSI: *Definitely*

This theme was also linked to the VCSIs having an awareness of other practitioners and their practices; this was initially coded as a separate node however its relationship with transmitting knowledge is clear.

Knowing about other practitioners' methods either via direct or indirect methods has the potential to influence practice. Participant 2 was asked to pick a technique or aspect of practice that she has copied. Here participant 2 discusses practice she has observed by participant 4 whilst being mentored in her role.

VCSI: *We erm, I told allotments and erm shed owners and what have you if they've just got like a flat piece of allotment, and you know like a flattened out cardboard box, put it in the entrance of, behind the door and then before they go in, lift it up and move it*

Participant 4 whilst implementing the practice and passing that knowledge forward had different emotional reasons for this type of offence. She recounts her observations of a police officer and the affection he had for this crime type, and participant 4 appears to share this same affiliation. Participant 4 is unable to explain where she learnt her technique of empowering the tenants of these properties to leave forensic traps, such as cardboard behind the door. Although she does give an insight in what they mean to her as crime types and the perception others have of them. The following transcription is one of the most powerful from all the research, not only it is emotive but it also has real benefit in that practitioners providing this information could have

an impact of repeat or near repeat victimisation. Dealing with near repeat victimisation has the potential to reduce overall crime (Townesley, Homel and Chseling, 2000), even more interesting is that the examiner implements her own cocooning by ensuring target hardening is not simply discussed with the aggrieved party but cascaded this message to others on the allotment. Again cocooning also has a benefit to reducing crime (Farrell and Pease, 1993) and so capturing this practice and measuring performance by acknowledging it has benefits. Furthermore this kind of service is not identified in routine performance indicators. The following is perhaps the most powerful of the transcripts included in this thesis. Not only does it capture work by the VCSI, this work separates VCSIs out from each other. This provides an example of what is not measured in performance metrics or captured explicitly in National Occupational Standards.

*VCSI: I get quite a lot from allotments but some people don't erm but yeah that kind of thing and I tell, I tell like if somebody put like a base paint over their shed I'll tell them to gloss it 'cos you get better fingerprints off gloss, and I explain it to them, I explain why I'm telling them to do something erm but yeah I do tend to give quite a lot crime prevention advice*

*VCSI: ... I actually asked the boss if the VCSI as part of their job could go around the allotments so in (police force area) just sit with the old fellas for ten minutes, once a week and just say have you had any problems this week, just because it's hitting crime straight on but the, he (a supervisor) wouldn't entertain it, we don't go looking for crime was his response*

*VCSI: Well it got turned down but I just thought 'cos allotment owners it really bugs me 'cos they won't frigging report stuff and erm they have all sorts of (...) happen to them you know, it just it really gets to me 'cos I just think well they don't understand there's a lot we can get if they report it*

*VCSI: And a lot of the SOCOs won't go out because it's an allotment and I just think there needs to be some kind of happy medium, see I'd love to do something like a masters on allotment 'cos I think all them old people though that have allotments, that's their life they go there and get on and they bloody race pigeons and grow veggies or whatever, but that's a big deal to them and people don't care and that's how it is, people don't care, cops don't care. When I was at (previous police employer) I used to go out with one cop called erm (name of experienced Police Officer) and do you know he, he, was an absolutely spot on cop, he was a good cop anyway, loved allotments, he'd go and every week spend time with the owners and just sit and talk to them so in (previous police employer) a lot of allotment burglaries got reported 'cos the cops were showing more of a presence...*

The sharing of tacit knowledge is therefore not just with other practitioners, these examples provides evidence that it also incorporates victims and potential victims of crime.

Participant 4, being more experienced of the four participants felt she did not need to mimic techniques at a micro level but instead expressed a wish to see how others processed the scene, in essence more cognitive skills than physical activities, for example *planning*. How the scene was approached, for example room by room or technique by technique (e.g. forensic work first then the fingerprint examination). This was more important to her in terms of her learning and development. There was also reflection in her account and after her explanation still did not have a fixed view on what approach or strategy to adopt.

*VCSI: ... but it's just interesting to see if other people have the same kind of thought trail as me sometimes*

*VCSI: ...do they think sometimes should I just concentrate on this room first and then go to the next one or do they all just have their own way of doing every single thing you know*

Participant 2 provided the clearest insight in wanting to learn from others and being a part of shared awareness, she expressed a desire to go out with Scenes of Crime Officers and observe their practices. She is however guarded and there is an unwillingness to not be to open and pushy.

*VCSI: See I'd love to do that, you know even as VCSI, you know, I, I would love just to go along and aid, you know I wouldn't mind even just to be a fly on the wall and literally just watch them but*

INT: How would you like to erm grow into your own role? How would, if the job could do something, what would that be to, to actually help you?

*VCSI: I really don't know, I don't know, I'd just personally, you know, would just like to get more experience in doing the role and developing my skills within it*

The above comment will be discussed in the following chapter, however there are qualitative accounts, to support the notion that not only are Tacit Knowledge and Shared Awareness opportunities welcomed but they also allow structure to a strategy. They were also on occasion purposefully sought after and desired.

### 3.10.4 Theme: Working Practices

This theme is connected with Sharing Awareness and Tacit Knowledge; however specific examples show some of the underlying reasons for certain practices, suggesting that there is variation in practice between practitioners. These differences can also be borne out of a dislike for a technique or resource rather than some analytical judgement about its productivity. Working practices appear also to be connected with personal preference, Participant 3 commented profoundly on who she thought was the best practitioner. The reasoning was not associated with finding forensic evidence or who had the most fingerprint identifications but instead how the pressures of the day are handled. Performance metrics meant little to this examiner in terms of who she wanted to learn from.

### 3.10.5 Theme: Managing expectations

Participants provided details on the type of crime requests they are expected to attend but also their feelings on attending these crime types, as well as the value and purpose. There are elements of *identity* in these passages but more specifically the evaluative nature on the value of evidence recovery, its significance and end destination potential. What is apparent is that there were differences of opinions on this value. The debate centres on whether items not initially packaged properly should be examined at all.

Participant 3

*VCSI: 'Cos I feel there's no point in us doing an examination of something where if it went to court then they'd just dismiss our evidence because of the continuity and if it's not been signed properly you know*

The above point is not shared completely by Participant 4. Participant 4 recognises that provided it is packaged up properly she would examine it, as long as trace evidence recovery was not required and it was simply a fingerprint examination. Here there seems to be 'negotiation' a practical pragmatic approach to real world working practices. A fingerprint examination is more robust in that inadvertent contamination is unlikely or impossible.



Participant 4 does acknowledge that the context of potential evidence is connected to its value; the example given was of footwear marks in snow positioned in an open area. Here the environment with its open aspect plays a part in the value afforded to the presence of footwear mark evidence. Participant 4 comments on this during her examination however it was an issue that was raised by the supervisor who suggested that such information need not be stated and could be irrelevant should the offenders be in custody. The VCSI brought this up in the interview and felt that the quality of evidence is something to consider and present or at least be mindful of. This again provided further confirmation that *Evaluation* as a node should be acknowledged.

Participant 4 has managed the expectations of the value of the evidence recovered, explained its significance suggesting also the importance an investigator should afford to this exhibit. Participant 3 is more direct with reference to the likelihood of obtaining forensic evidence and indeed which stakeholders have the greatest expectation. This section of the interview also encapsulated other points raised by other participants, in that the injured party or victims of crime do not always share such expectations.

Themes did not evolve independently, instead discussions from one question provided further support to another; answers provided trust or faith in these themes. Participant 3 in a series of transcripts discusses a number of points that provide further evidence of the themes presented; furthermore a sense of frustration also emerged. Interview questioning elicited her reasons for her role model, someone that could handle the day to day frustration rather than being a mentor in yielding high forensic product identifications. Being able to deal with confusion or diversions is evidently fixed within the role of being a VCSI.

*VCSI: ... , we got asked to go to erm a garage erm like a house garage erm where the bloke had his bike stolen, ... excuse me, he'd left the, the garage door unlocked*

INT: Right so there was no forced entry?

*VCSI: And no and there was obviously fingerprints all over the horribly flaky paint and to sort of add another point ... it had an internal door so we shouldn't have gone anyway 'cos it was obviously classed as burglary dwelling*

The above example also picks up an example on the difficulty in classifying crime, further examples related to the attendance of a VCSI to a female victim that had an innocuous liquid thrown in her face. Had the liquid caused injury a Scenes of Crime Officer would have been asked to attend. Confusion and misunderstandings are evident within the role and knowing how to deal with these is clearly a skill and goes some way to explaining why one VCSI chose as her role model a seasoned forensic examiner that took these frustrations in his stride. Even in the example above evidence still continues to emerge as to the evaluative nature needed in the role, in order to appreciate the value of forensic evidence and the likelihood of obtaining it.

## Conclusion

This chapter began by exploring differences between expert and novice forensic examiners. Eye-tracker technology measured searching activity and from this a better understanding of differences in ability levels was obtained. These activities also provided markers to explore further in the ethnographic study. Reflection played a part in developing expertise. The unpacking and significance of this is to be discussed in the next chapter, nevertheless early indications do provide support for the presence of tacit knowledge in the workplace. Participants clearly spent much time analysing the surface on which they were looking for forensic evidence, evaluating its significance and worth as well as how they themselves operated in this environment. Here they expressed feelings of being professional despite conflicting factors that made evidence recovery problematic or limiting. It is apparent that there is much diversity of practice in the role with examiners having a preference of what works best for them. Frustrations experienced in everyday practice of being a VCSI were also aired and should also be acknowledged as being part and parcel of work. At another level there was much homogeneity between practitioner practice; this was captured in the spatial plots. *Documentation* and observing the scene were infrequent partners however *Communication*, *Gathering information* and developing a *Strategy* were very much aligned.

The themes derived from the interviews were interesting in that a sense of

identity was felt to be important as well as practitioners seeking out tacit knowledge from others or recognising it when it happened. Participants also began to manage imperfections of the real world. Feelings of frustration at the limiting opportunities they could afford when the crime environment was not preserved or simply the reality of forensically examining surfaces that are wholly unsuitable.

Although the following chapter will mine these in more detail, these are nevertheless interesting discoveries in that through these themes and experimental data it has been possible to test the constructed methodology scoped out in Chapter 2. Furthermore this methodology has uncovered ways of working that has not been described before and confidently answers with a positive affirmation the third research question.

- *Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?*

At the one level this methodology has exposed how emotion and personal outlook may be connected to understanding the crime scene environment. This understanding is different and richer than obtaining an impression of practitioner practice through analysing numerical metrics of forensic products collected and identified. Consequently it also opens up the fourth research question. If this new observation methodology has allowed a better grasp of what experts and novices do differently, as well as how apprentices move forward in their expertise development; then it should be integrated into how practitioners are monitored and developed.

## 4 Chapter 4 Discussion

### Introduction

This chapter explains in detail the results, tables and figures presented in the previous chapter; notably the mobile eye-tracker data (Figure 3.8 and Figure 3.9), the tabulated themes derived from theory, the data codings of role profiles and employment advertisements. The limitations and important developments from these studies are explained before leading to the main area of data generation and the observation of Volume Crime Scene Investigator practice captured using head camera technology. This chapter also goes back over and sets out the first research question:

*'What is the role of the Volume Crime Scene Investigator and where does it sit within UK Policing?'*

The transcription material and spatial plots provide the raw material for analysis and at this juncture these data are then interpreted. It is equally pertinent in this chapter to comment on the fourth research question:

*'Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?'*

Overarching answers from the literature as well as the experimental work feed into this question as new ways of measuring and observation have emerged. Specific propositions for the domain to consider are succinctly presented in the following Recommendations and Conclusion section of this thesis.

The work of what expertise consists of and how this is related to performance has already been described in Chapter 1, it is important nevertheless to briefly explore this question and how it has been expressed in other dynamic domains. This is needed in order for it to join neatly with the fourth research

in exploring the development of forensic practitioners. Black *et al.* (2010) provide a useful perspective on expertise and that:

*“The goal in studying expertise is not merely to describe ways in which experts excel but also to understand how experts develop in order to better facilitate the development of novices.”*

The question posed by Black *et al.* is that in order to begin the preparation of learners, it is important to explore and identify what is known or indeed not known about the learning of practitioners in the early stages of their career. Black *et al.* used 11 new graduates and investigated the progress of their purposive sample for a year via reflective journals and semi-structured interviews along with résumés. This methodology resembles that conducted with the four Volume Crime Scene Investigators however this thesis also utilises categorised head-mounted camera footage. Themes from the volume crime field study are remarkably similar to that presented by Black *et al.* suggesting a congruent path for any practitioner settling into the real world environment.

Crime Scene Investigation does not yet have the dense level of expertise literature as seen in Physical Therapy (Hayward *et al.* 2013; Jensen *et al.* 2000; Resnik and Jensen, 2003; Solomon & Miller, 2005), moreover this domain has also had specific attention in the area of *decision making* for over two decades (May & Dennis, 1991). That said much can be learnt from this domain and others as methodologies are compatible and have general appeal.

#### **4.1 Aligning and mapping the results with literature**

Expertise and expert performance literature has provided a number of useful thematic backdrops from which to explore and study the work of examiners in particular Volume Crime Scene Investigators. Theory in this field not only provided an understanding as to why experts and novices are different in their approaches to work, it has also provided a strong methodological stance on which to make sense of practice. Moreover the ontological positions on

engineering ergonomics and social science research principles no longer exist as a dichotomy. Instead boundaries are blurred and overlapping with a toolbox approach for all methods of work-related study. Consequently techniques such as process tracing and frequency counts under the umbrella of Cognitive Task Analysis can sit alongside the Grounded Theory tools of *constant comparison*, leading to the generation of conceptual themes. This approach is equally placed to construct a framework to categorise work as it is to assist in making sense of a detailed interview. Controversially Deakin, Côté and Harvey (2006 p. 314) still posit that coding of actions should be constructed in such a way that it generates frequency data.

*“the researcher must choose a procedure for converting observed behaviours or events into quantitative data.”*

Literature has been able to explain how expert performers think and act, spending more time understanding the problem than novices but also being able to group processes together. This grouping allows more efficient use of time and energy in completing a task. This was noted in the searching strategies between the expert and novice examiners. Here problems were reframed by experts with reflection being fundamental to arriving at a conclusion. In general experts feel more comfortable in working on the periphery of their own competence or understanding, where rules for guidance in general instances are not routinely practised. Table 1.3 depicts the different approaches to grading or categorising expertise. This alignment enables different levels of performance criteria to be mapped. In general principle, experts appear to be able to accumulate and work with tacit knowledge to solve or implicitly understanding the problem. Furthermore the concept of reflection is intrinsically linked to reframing the problem at hand. Consequently Deakin, Côté and Harvey (2006) comments could be construed to them missing the value of rich description in ethnography and phenomenology.

Expertise has eluded a firm description or definition, instead generic examples about what an expert is capable of have been presented. The inability to describe an expert is not a hindrance or an acknowledgment of

poor understanding; instead markers are presented as to what identifies an expert or novice. These descriptions inform on the capabilities but not on what can be implemented to move a novice or naive user to becoming an expert. Tacit knowledge derived from reflection has the potential to increase practical intelligence. The challenge for each domain is to identify and implement the tools that shape a novice to becoming an expert.

This chapter also captures and examines what specifically developed the Volume Crime Scene Investigators in their work along with examples of their practice that showed another side to performance that is not routinely monitored or measured. This pertinent point is important to consider as is the principle element to the fourth research question as to whether another side of VCSI practice should be developed and measured. A side different to frequency metrics but offering value nonetheless.

## **4.2 Discussion of eye-tracker results between novices and experts (SOCOs)**

### **4.2.1 Quantitative data analysis**

In Figure 3.9 and Figure 3.8 it is apparent students took longer and viewed more items within the simulated crime scenes than the experienced Scenes of Crime Officers (examiners). This observation was noted for both simulated scenes (office and lounge). Both groups viewed more items and took longer for the lounge scene. This was not an unusual observation as the lounge was a larger space and incorporated an outside element. Here the lounge window was forced open and the locking stay unscrewed; with the screws being placed in a neat collection under the window. The unscrewed stay allowed the top hung casement window to be opened to its full extension, and important feature to note in a burglary offence.

Figure 3.7 presents the number of comments for the two groups but specifically the break down across the different categories *Modus Operandi*, *Object*, *Evidence and Scene*. The difference overall from the number of comments was slight however variations did exist between the two groups for categories *Evidence* and *Object*, and these were statistically significant with novices recording more frequency counts for an object but fewer counts in comparison than the expert group for evidence within the scene. Experts represented by Scenes of Crime Officers from three Police Forces recorded fewer frequency counts for *objects* but higher scores for *evidence* within the scene. Differences between the two groups for *Modus Operandi* were not statistically significant. This suggests that both groups were concerned with the actions of the offender once they entered the property.

It is submitted that expert examiners homed in on specific locations within the simulated crime scene paying much less attention to unnecessary objects such as pictures on the wall, lampshades and similar room furniture. However the expert group made more comments in relation to the evidence types on offer.

These results suggest that the expert group appreciated the evidential weight of evidence types and that their search strategy was more focussed and controlled.

The possible reasons for the reduction in time between the two groups, and the time spent on searching is perhaps governed by other activities such as when expert examiners would be completing a crime scene report form, photographing an environment or object and packaging exhibits (Smith *et al.* 2008). The location of the evidence types positioned in the lounge were also much less overt, here participants needed to view items at an angle, using the available light to their advantage to view footwear and finger marks on smooth surfaces such as glass. Glove marks were also apparent in this scene which may not have been easily recognisable for the students (novices) to understand.



Crime Scene experts and novices saw and interpreted the same physical material differently, an aspect seen in the decision making process of Radiographers making sense of anomalies in x-rays (Lesgold *et al.* 1988). In essence the expert group spent longer analysing what was in the scene and what it all meant, but used their time more productively by examining fewer objects. It is critical to note that finding the forensic evidence in the scene was not an issue for the novice group, despite their lack of expertise in searching.

#### 4.2.2 Qualitative data analysis.

The study into differences between expert and novice searching strategies in the simulated crime scene did not conceive exploring *reflection* however this did become an important part of the following field study. This emerged during the transcription phase as the following account demonstrates. (The number in the brackets below represents the time in seconds of each pause in speech.)

*“There’s **jemmy marks** on the (.) two points of the window frame. A red fibre on the window frame as well. **Corresponding marks jemmy marks** on (.) **the outside** of the frame. Window itself doesn’t open (0.5+) which makes it unusual **don’t know how they’ve got through. Jemmy marks** are probably **caused by the inside** of the window here I think this is been **done from inside** (0.5+) **rather than outside** (0.5+) and the window won’t allow anyone else to get out (0.5+)so (0.5+) there must be another point of entry it must be through the door. Jemmy marks are not on the outside of the frame. So that jemmy has been caused from the inside.”*

Comment from an examiner in the expert group.

The above comment identifies many of the nodes presented in the Results chapter however behind the observation of force marks on the window there is also a great deal of reflection. By following this through it is possible to ascertain that initially the jemmy marks were on the outside of the frame, then very quickly (and correctly) this moved to a position that suggests the marks have probably been produced on the inside rather than the outside. The expert examiner tests this theory by seeing how far the window can open

*“window won’t allow anyone to get out. There must be another point of entry.”*

The final and firm position is that the marks have been produced from the inside and not the outside. Statements opposite to this or those using the adverb *probably* are not presented, instead a final confirmation is offered by the expert examiner.

This example is a function of expertise, the ability to reflect in action. The crime scene presenting confusing messages is akin to Schön's description of the bad lands or swamp. In simple terms experts are comfortable with working on the periphery of their own competence or dealing with cases beyond the norm. In this case the expert worked within this murky simulation, trying to find answers to the cues in the environment.

The above reflection example consequently informed the research methods in the field study, moreover it highlighted that connections between physical actions and verbal statements around cognition are interesting and useful to uncover investigator practice. Knowing when and what an examiner analyses is useful in taking forward that strategy and context for novice practitioners to experience and practise.

In conclusion the approach between the two groups was different with the expert group being less distracted by irrelevant objects or aspects of the scene and affording less mechanistic approaches to viewing the crime scene. This chimes with Westerman (1991), whose early work illuminates differences between novice and expert teachers; in this instance the expert group pays less attention to the needs of the student but instead gives greater attention to the learning outcomes. Conversely the expert group understood the needs of the student much more during the planning phase. Expert crime scene investigators did not simply view their scenes in isolation, many comments cited the protocols of their place of work and what policies official or otherwise were important to consider. In this instance the needs of the workforce are met as much as the need to observe; record and recover forensic evidence.

The eye-tracker work recording the *own point of view* of the participants also allowed the exploration and value of verbal protocol comments as well as the

feasibility of wearing head-mounted video recording technology during searching activities. This first study identified the beginnings of a workable methodology to capture individual practitioner practice in the real world environment. The ability to test equipment and observation frameworks in a crime laboratory was again useful in terms of the feedback received by the participants on how the space was used and whether the equipment or protocols influenced the work being observed.

It should be acknowledged that limitations did exist in the first study; these cannot be ignored and were fundamental in driving forward a new study in a real world environment. A fundamental limitation in the first study was that participants were not expected to carry out an examination to recover or enhance forensic samples such as fingerprints and footwear marks. There was also no requirement to record the scene using photographic equipment. This was built into the experimental design in order to control for variables between the two groups; comments raised by the expert examiners showed that 'searching' and other aspects of work are not always necessarily separate.

The calibration time of the eye-tracker was different for each participant along with the accuracy of the pupil lock. This also indicated that using eye-tracker technology in a harsh environment would damage the equipment as well as impose an unacceptable process time for the VCSI participants to operate.

The differences between the trial and real world experiment were different for a number of reasons: First, the type of scenes were not burglary dwellings in the field study. The true extent or limitations of the crime types the Volume Crime Scene Investigators would or could examine was not known. However the complexity of the burglary dwelling in the crime laboratory did suggest that non high profile scenes offered much complexity and opportunities for analysis. There was also the possible influence on decision making from ambient temperature, wind and other environmental conditions. Second it was recognised immediately that the calibration of an eye-tracker device was going to be problematic in a real world police environment, moreover the

exposure of this technology to fine metal fingerprint powder was foreseen to be highly destructive to the mirror that recorded pupil movement. Volume crime scene examination was also believed to be heavily outdoor based. Consequently bright sunlight was equally likely to affect the eye-tracker's ability to lock on to the infra-red signal at the back of the eye when faced with strong infra-red signals from bright sunlight in an outdoor setting. Third the field work needed to move beyond searching strategies, it had to take into account the dynamic nature of the work in particular interactions with the aggrieved party, the physical examination as well as cover a wide range of volume crime types.

A better understanding of the role of the Volume Crime Scene Investigator and crime scene examination in general was needed. The initial approach analysed the content of the role profiles for this occupation. Table 3.11 in the results section outlines the categories used. A total of 42 role profiles and advertisements were used from 11 different police forces. After an initial sift of repeated statements between the different police forces profiles and the exclusion of skills that related to serious or major crime a list of 170 statements were produced and catalogued in Microsoft Excel 2010. In conjunction with the results from the eye-tracker experiment and the role profile statements an observation framework was constructed. Table 3.11 presents the 13 categories with generic statements that explain what each category consists of, as well as the limitation or boundaries of each category. Additional categories were originally presented however after a period of coding it was not possible to be consistent. For example powdering for footwear marks or powdering for fingermarks could not be isolated; this either generated coding examples that were either recorded too infrequently or the process of powdering would generate examples for both evidence types during a continued phase of the examination. Consequently *powdering* as a category irrespective of powder or brush type was adopted. Similar examples were also seen with the lifting media used; isolating whether the media was gelatine or tape based did not add more understanding of the process nor did isolating specific stages for example: *preservation*, *evidence recovery* or

*preparation*. Investigator practice was often so fluid, with verbal comments running over these stages. It is acknowledged that collapsing the categories is a limitation to understanding what actions are occurring at a micro level for example the differences between using gelatine and tape, however with the data sample obtained a further break down of these categories (later defined as nodes in NVivo9) allow detailed and practical analysis of live data. Moreover the number of categories requires management in order for these to be realistically coded. Welsh (2002) provides a succinct and well-structured argument for using NVivo, the version used at the time of the paper is now obsolete however primary functionality remains the same. Interestingly the notion of accuracy is presented by Welsh: the use of software is more accurate over traditional approaches in so much as query searches will bring all available material under the specific node. Welsh does not ignore the fact that researchers bring their own beliefs to their work and that interpretations are made from data. Nevertheless comment is provided in that Grounded Theory tools can be used even if this use is not strictly orthodox in its approach.

Strict definitions of the verbal comments is also included in Table 14, this was necessary for the verbal protocol analysis. These definitions also allow additional researchers to first appreciate the origins of the categories, their relationship with other domains and for a general consensus to accept the definitions presented.

The nodes were categorised under two headings in NVivo9: Physical nodes and Verbal nodes. The purpose of this was to establish which spoken comments were aligned with which physical actions performed by the examiner. Initial trials of coding data suggested a move of the node *Identifies forensic evidence* from the physical node to the verbal node. Since the technology was not eye-tracker based it was not possible to be certain that the examiner had indeed seen the evidence type even if the object fell within the centre of the frame. In all the examples where evidence (or areas of interest for the potential of forensic material) was observed these were also verbally commented on. The framework depicted in Table 3.11 formed a key

area of the research project, from this framework over 1300 codes were assigned to the nodes listed.

It is also necessary to note that the nodes in the framework were also compared to the material uncovered in the literature. Themes that emerged from the literature review such as analysing the crime scene, obtaining information from the injured party and similar all fell within the observation framework.

### **4.3 Resourcing on-site support: a review of the process.**

The differences between the novice and expert group was interesting, along with the off-camera comments, whilst these differences have already been explained it was acknowledged from these results that the field research in a real world setting needed to incorporate reflective journals. These journals were intended to triangulate results from the semi-structured interviews and field data. Moreover evidence already emerged from the eye-tracker work that showed reflection was part and parcel of being an expert examiner.

Gate keeper access and permission has been dealt with in the previous section although it is worth noting that the amount of researcher support for the field study was initially unknown. Provision had been made for an internal monitor and the equipment had been bench tested with additional informal trials using undergraduate students prior to the field study going live. Daily checks were nevertheless needed to ensure the equipment was servicing the examiners although it was not known how much extra time using the equipment would take, coupled with the verbal concurrent reports. Estimated figures had only been obtained in simulated settings and extra time was known to be a factor prior to the study, this has been acknowledged more recently (Fox, Ericsson, Best, 2011). Regular on-site visits throughout the study were important and were seen to demonstrate commitment. Initial visits were in excess of 3 on-site visits per week for the first month and where equipment failed to work, attendance was within twenty four hours. This was

necessary as the following section demonstrates the additional effort needed to capture performance by the examiner and so any disruption to recording needed to be resolved immediately.

**Selection of transcript from Participant 4's Interview:**

VCSI: ... one day last week I was out with (name of participant 1), think we had about six jobs and then we ended up with about ten so like you just don't have time to particularly think I'll put the headcam on and I'll arrange for the headcam 'cos when you've got all the stuff to do when you come back with the headcam, it's not too much that you would be, just ignore the narration and get on and do it, that would be fine.

Int: Yeah

VCSI: But when you've got all your reflections to do and putting it on the computer and it's just extra time and if it's busy.

The VCSI expressed that wearing the head-mounted camera was not the issue, instead it was the associated time taken to explain the examination process. This suggested that speaking aloud does impact on performance.

VCSI: I think speaking takes more time 'cos you're thinking about what you have to say for the narration. I mean it wouldn't bother me just wearing it... no it's the speaking thing 'cos you're consciously saying I'm going to do this, I'm just considering this, I'm going to move onto this next

#### **4.3.1 Reliance and guidance from mentor, supervisor and peers.**

The themes generated from the interviews were interesting in so much as the need for the Volume Crime Scene Investigators to be reassured was evident. They knew principally how to operate but needed confidence that the decisions made were correct, this again links with Black *et al.* (2010) in that as with Physical Therapists the first year of working independently is exciting with new challenges.

*“rewarding period of personal and professional growth...in their initial practise, there was a focus on the mechanics of practise (e.g., juggling caseloads and paper work, learning techniques, finding mentors.)”*

These same issues paralleled the volume crime participants in this study and clearly emerged in the themes presented in the previous chapter. Before

these themes are explored, it is necessary to explain the type of learning practitioners engage with during this crucial period of personal and professional growth. It is through an understanding of the situations, locations and context of these events that allows the focus of how novices are prepared to be made clear.

#### **4.4 Describing, Evaluating and Analysing: A review of these reflection themes and their importance in the development of novices.**

In their reflections Volume Crime Scene Investigators spent a good deal of their time describing the scene. This is a highly important aspect of their work and was not viewed as being lazy although its function or purpose in reflective writing is acknowledged as being limited. Being descriptive is necessary as examiners needed to record the scene as they found it and this forms a substantial part of their training. The descriptive accounts were however largely focussed on potential evidence and matched similar wording to their scenes of crime report forms. This reflective process occurred close to their working day and it is appreciated that fatigue sets in at this point. Describing the scene as a process was seen in the earlier eye-tracker work and the number of comments relating to *evidence*, was very different between the two groups. It is unsurprising therefore that the process of describing evidence and its location featured as a theme in the reflective logs. Prior to coding in NVivo 9 it was not known whether any other themes would emerge, however once *describing* codes were isolated, further themes specific to practice and its development began to surface.

*Evaluation of self and the crime scene* was a large and complex theme made up of a number of different elements. The first of these to be addressed is: *Attitude and Behaviour*. This theme recognised how examiners evaluated the scene as well as their own behaviour, attitude and performance. It was apparent that many of the words used to describe their behaviour were centred round their attitude, for example, being positive. However a closer look at the language revealed that it was not simply about being positive, it



was about having this attitude when dealing with the routine nature of volume crime. Coupled with this attitude were further references to being professional often with an emotional response. One particular experience clearly stuck in an examiner's mind as the aggrieved family conveyed deep frustration and anger for being the repeat victim of petty crime. Within this element was a sense of *soldiering on* by the practitioner even though the situation was likely to be fruitless in terms of yielding forensic opportunities. Another example is where a VCSI comments on seeing glove marks, marks she believes relate to the offender making an effort to conceal their fingermarks. She continued with the belief that there was a chance that the gloves may have been removed even for a second.

This behaviour and similar comments were also seen in the interview transcripts. Examiners knew the classification of crime that they attend is regarded by many as being in the lowest bracket. Moreover they are aware themselves of the limited opportunities to obtain forensic evidence from the crime types they attend. This theme went further and explored attitude and behaviour in relation to the decisions made or actions taken, it was "*right to let the pot dry out*", or "*communicated well with the IP*" (injured party). Positive reinforcement came across strongly once the data was coded.

Expanding on from this, examiners felt comfortable enough to express their feelings, the coding revealed examples where they felt blinkered, confused or even vulnerable. In one instance not only was the size of the scene to examine too big, other crime enquiries impacted on their emotional state, bringing on a sense of rushing. There was also a feeling of wanting to be more confident with one's decisions. This maps across to comments in the literature about being 'consciously competent', or at least a feeling or security in the decisions that are made.

Examiners in their reflections were not naive to the notion that volume crime often has limited forensic possibilities. It is important to accept that these opinions or perceptions are positioned not against volume crime in general but must be seen within the framework of the definition as described by the

police force in question. What is clear is that whilst the examiners had limited experience, their experiences were already quite well formed as to the likelihood of obtaining forensic material. Table 3.5 presents a list of transcribed comments from the reflective journal. These comments suggested that the likelihood of obtaining forensic evidence was decided in some instances even prior to the scene examination, while others were quickly decided after an initial visual examination. This category had overlapping comments with the *analysis* category as evaluations were often based upon the analysis of the item or scene being examined.

Table 3.6 shows that *time lapsed*, before reporting the offence or attending the scene was associated with the possibility of obtaining forensic evidence. Moreover the actions of the aggrieved party were also related to this variable. Here the time delay to attend the crime scene by the VCSI may have been unacceptable by the aggrieved party and repairs or actions to secure property and vehicles were carried out before the arrival of the examiner. *Time* was commented upon by each of the participants and deemed to be important to the opportunity for forensic recovery.

Table 3.7 presents the theme *evaluation of practice*; a traditional component of evaluation and indeed reflection literature. Here practitioners really expressed what they would do differently or at least presented in some instances what could be done as an alternative to their initial actions, decisions and choices. Table 3.7 offers many examples all of which appear honest and sincere. These examples acknowledge what went wrong or what could be improved. These include over-powdering when fingerprinting surfaces, handling objects inappropriately, with the possibility of ruining latent impressions, working out casting mixture ratios, examination sequence and the possibility of contaminating DNA evidence types with fingerprint powders. Many of the comments reflected on alternative practice methods, which emerged either from direct reflection on action or from discussions with the scenes of crime supervisor. The value of this mentoring was not measured however this point does connected strongly with Vygotsky's zone of proximal development and is a feature in the Recommendations Chapter. Specific

examples relate to taking additional and alternative forensic samples as well as intelligence, for example measuring instrument marks left at the crime scene.

Many of the reflective comments had an element of 'prior knowing'. That is the examiner knew what needed to be done but failed to carry out that action at the time. Other comments centred on a desire to become proficient, for example knowing how to mix the correct ratio of casting agent each and every time. The skills involved in this task take into account the ambient temperature and amount of mixture required. Other examples seemed incredibly simple but focussed on the basics, and getting these right, such as becoming competent in using a tripod, *effortlessly*. Comments also covered critical incidents, these are instances whereby inappropriate practices were checked just in time. These seemed to be important to the practitioner in that such instances are seen as a lucky escape with a reflection to ensure these checks are repeated.

*Remember to swab before powder – I get over excited and opened property that didn't need forensic exam before property that did! However corrected myself in time.*

Some of the incidents experienced were believed to be correct at the time and indeed afterwards, however the examiner has chosen to comment on other possibilities or alternatives, even though they are satisfied with their choice. These are interesting in that this very process appears to build security in these decisions, perhaps a sense of being unsure existed but this insecurity has moved to a more solidified state. Examples are also present where insecurity is captured, before seeking assurances or guidance.

*On reflection, I am going to discuss with (SOCO supervisor's name) whether anything can be obtained from the wick inside the bottle.*

Here actions and decisions remain confusing, a sense of knowing is not yet transparent and insecurity remains, coupled with a desire to seek out new techniques and knowledge. Acceptance from the supervisor also appears to be a part of enculturation. Reaffirming practice and having a sense of

knowing is necessary to justify actions; investigator practice is reflected upon with justification statements wrapped around the decision.

*and settled for bi-cro as I felt this would give the best contrast and I prefer it to aluminium.*

*I proceeded to examine the tape sections with magneta which showed some smudges but overall was negative. Aluminium would have been unsuitable due to the rougher porous texture of the boxes.*

As described in the Results chapter the *analysis* and *evaluation* categories are interwoven. That is to say additional meaning is conveyed other than the meaning in the words themselves. Descriptions of objects and surfaces may not always have an evaluation component attached to it, often this is implied in the analysis of the object itself; nevertheless evaluation comments are justified by an analysis of the surface type. These analysis statements also steered actions and decisions during the examination or indeed justified why no examination was carried out.

*it was too wet/soaking just damp enough to impede with my examination decided not to as surface was very worn + scratched.*

This category also presented instances where the actions of the offender were recorded. These are interesting in that earlier references position the Crime Scene Examiner as someone who is not afforded the level of an expert witness. Literature is not clear on this with an ambiguity surrounding what can or cannot be said in court. What is clear is that the position of the Crime Scene Examiner to some is one of non-expert and this standpoint is unwavering.

Connecting with the comments in the literature review on the subject of expert witness status is interesting as within the category of *Analysis* was the element, *Interpretation and Reconstruction*. Here examiners made assessments as to the offender's actions and decision making processes. These were either from how entry was gained to the property, movement within the property (or vehicle) as well as intended actions by the offender(s).

*as I know the offenders have definitely handled this to remove the alloy wheels - especially the handle area,*

*If the doors were fully framed rather than “coupe” doors, I think this would have been intended as a bend back*

Furthermore these reconstructions steered the examination strategy, that is to say an opinion was needed to be formed to initiate the sequence of events and consequently the potential for evidence to be considered as likely.

*I targeted specific areas where offenders more likely to have touched e.g. on edges 3/4 up as that's how opened + above handle + edges.*

Cory (2008 a,b,c) as the interim Forensic Regulator consulted with Scientific Support Managers and the Forensic Science Advisory Council in relation to the expression ‘expert witness’, suggesting that this could be defined and to “whom it could be applied.” Furthermore how practitioner competence could be evidenced and importantly how it would be recognised was also raised. These discussions are against a backdrop of the Council for the Registration of Forensic Practitioners having once played a role in this and in later years before losing its funding and ceasing to operate. Nevertheless how to recognise Crime Scene Investigator skills and the controversial issue of who or what is an expert was documented, see item 9 below point 40 (Cory, 2008)

*“agreed a definition of “forensic science” should be prepared agreed paragraph 2.2.2 (ii) (b) should be amended to replace “expert witness” with “forensic practitioner.”*

The Scientific Support managers agreed that the term expert witness should not be used. This thesis presents evidence that the role can only operate if practitioners are interpreting, analysing and evaluating evidence, even if that process is far from being overt in the court statement.

Table 3.10 presents examples and suggests that the analysis of the scene must involve interpretation and reconstruction, moreover this would be especially true where the point of entry is unknown or where intelligence is unclear.

Categories *analysis*, and *evaluation* along with the themes that represent these categories reinforced the concept that the nodes used to map the work

of the examiners was robust. Here emerging themes in the reflection triangulate with the results obtained from the head camera footage. Further examples about investigator practice that draw upon these examples are also to be found in the interview data.

Newell (1992) viewed the reflective process as potentially flawed. This is primarily due to memory being reconstructed. It is argued that this is remedied by reflecting soon after the event and using technology to make this more easily achievable. Newell is not clear whether this includes professions that have the ability to read their notes made at the time of the examination. It is reasoned that reflection diaries recorded soon after the event (utilising crime scene notes) is beneficial. Since memory is aided through being able to revisit the experience through photographs and recorded details.

#### **4.5 Examining spatial plot data and its significance in explaining practice**

Each head-mounted camera video footage was viewed a number of times after being converted into a Windows Media Video file. This file format reduced the file size and allowed additional features to be present on the NVivo9 toolbar namely fast forward and rewind. These were not present when the existing avi format was used moreover the buffer lag when using .avi format was not practical for coding since the audio and video were no longer in sequence. This was not improved sufficiently even when the computer used for the data analysis had its Random Access Memory upgraded to six Gigabytes. For general viewing and coding of the recorded scenes the Windows Media file format was more than sufficient, even providing photographic digital stills.

Annotations were used in the NVivo9 software, these acted as place holders in the video. These annotations were important since they provided a written commentary of the crime scene examination, whether it was of dialogue or physical actions by the examiner. Coding of nodes were recorded here in

principal, once satisfied that the sequence of video and audio comments were properly appreciated this section of video containing the action was coded under the appropriate physical and verbal nodes. It was recognised that verbal accounts do not always align with perfect symmetry against examination techniques. A number of physical actions took place with the examiner commenting on only a few of these actions. NVivo9 as a tool should therefore not be confused with software that provides a quantitative output in controlled conditions such as Observer XT by Noldus. Furthermore NVivo 9 does not provide a sequence analysis, an aspect initially considered during trials with Etholog. That said: provided suitable breaks occur in the middle of actions it was possible for the cluster analysis to record actions and verbal reports for the specific nodes listed in the framework.

Whilst Jaccard's Coefficients were present to offer an element of strength for each cluster of coded nodes, it is necessary to recognise that these are qualitative in construction and presentation. The Jaccard's Coefficient and the clusters offer an interesting interpretation of investigator practice not a precise measurement of that practice. That said the measurement was deemed better than alternatives such as correspondence analysis as the coding of Data in NVivo 9 allowed for multiple codes to be grouped at the same time. In simple terms NVivo 9 allowed for the fuzzy complex real world work of Crime Scene Examination to be analysed and was felt to be better than recording frequency counts that would not shed light on understanding investigators practice.

Gaining an understanding of practice was now realistic and opened up opportunities to the fourth and final research question.

*Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?*

An interpretation of the results thus far has demonstrated that there is far more to VCSI work than simply finding forensic evidence, consequently developing the forensic practitioner must concentrate on these aspects of work, and when they occur during the examination phase. It has also been

established that the technology to capture operational crime scene work is available and affordable. Moreover the nature of the work is complex even at the volume crime level. In addition to this the interaction with the victim or aggrieved party offers opportunity to help them understand the crime and ways to combat repeat victimisation. This emotional support does not seem to be measured in the existing metrics nor is the value of the crime prevention strategies offered by the VCSI. This connection with the community coupled with cocooning and target hardening is evidently important for the police service. The argument is now established that there are other aspects of investigator practice that should be developed. That the theory of expertise along with the methodology in this thesis offers a real sense of developing investigator practice which is valued, but perhaps not recognised in current performance metrics or associated standards.

Examples in this thesis have shown that empathy, understanding economics and commodities such as the rising cost of metal and the value of specific car models, all relate to why the crime has occurred.

#### **4.5.1 Interpreting clustered nodes.**

The following section makes ground on how investigator practice was formulated in the real world environment, exploring how the visual examination is connected with other areas of work, or what aspects influence investigator practice. The function of the clusters was to make sense of complex and dense data.

The spatial plots depicted in the Results Chapter provided some sense of how investigator practice was formulated. The specific arrangement of the nodes in the three dimensional cube allowed rotation in all three planes: x, y and z. This rotation can be achieved either through selecting a specific measurement for each of the planes or through manual rotation, the latter being most convenient of the two methods. The spatial plot data does not stand on its own; it is connected and spatially illustrates the data presented in the dendrograms (see Figure 3.17, Figure 3.20, Figure 3.23, Figure 3.26 and



Figure 3.29). The number of clusters is determined by the user and is dependent on how coarse or fine the data is to be examined. Eight clusters were selected as these fairly and evenly represented the arrangement in the dendrograms and yet still offered a level of distinctness for the thirteen nodes.

Figure 3.18 and Figure 3.19 present the results of the spatial plot for participant 1, here it can be seen that nodes *Communication* and *Gathering Information* are clustered, as is the Node *Preservation/Recovery/Packaging with Documentation*. *Visual searching*, *Resource Selection/Preparation*, *Evaluating*, *Strategy* and *Analysis* are also all clustered together. That is to say there were many instances of these nodes being coded together for specific sequences of video footage. This coding can also be viewed in NVivo 9 through the use of the coding stripe viewer, here the highlighted sections of the video are coloured to represent the nodes coded for that section of video. The viewing of the clusters should also be carried out in conjunction with nodes that are not clustered, even if there would seem to be a natural association. *Documentation* was not clustered with the *visual examination*, participant 1 did not write down her observations, evaluations or strategies whilst they were happening. It was only when evidence was being Preserved, Recovered or Packaged did any form of documentation take place. Further analysis suggests that it was only when an item was being packaged as an exhibit did any form of recording take place for this participant, moreover documenting in these instances was not done on the crime scene report form but on the packaging itself, either in the form of *minimum details* on the bag or the completion of the Criminal Justice Act Label.

Participant 2 also had *Communication* and *Gathering Information* as clustered nodes, *Photography* and *Gel lifting* were clustered, as were *Visual Examination*, *Strategy*, *Evaluate*, *Analyse* and *Resource Selection*. The arrangement may appear differently to participant 1 however the clustering of many of the nodes is the same. Again *Documentation* is not clustered with

any node although is near in space to the node *Preservation/Recovery/Packaging*.

Participant 3 also has nodes *Communication* and *Gathering information* as a cluster. *Visual examination* is clustered with the *Analyse* node, these are not clustered with *Resource selection and preparation* and *Strategy*, although are positioned in close proximity on the spatial plot, moreover the dendrogram reveals that these nodes are within the same second level branch.

Interestingly participant 3 has a cluster not seen for participants 1 and 2, here nodes *Powdering* and *Identifying forensic evidence* are clustered, further inspection of the coding stripes, and annotations suggests that the references related to fingerprint examinations. During the powdering phase fingermarks were enhanced and recognised as potential evidence. This illustrated the nature with NVivo 9 to identify patterns of behaviour but not to afford a statistical measurement. More importantly the qualitative approach is justified since each examination was different for each of the crime scenes or property examined.

Participant 4 as with previous participants shows a cluster for the nodes *Documentation* and *Preservation/Recovery/Packaging*. Moreover this was again reviewed and found that the documentation did not include additions to the crime scene report form; documentation was confined to the completion of the Criminal Justice Act Label. Although the nodes *Powdering* and *Identifies Forensic Evidence* were not clustered reviewing the segments of video footage do support some of the findings for participant 3. In that instance fingerprint examinations using powder were aligned with identifying forensic evidence. In the case of participant 4 this was not clustered but believed to be associated with the *Evaluation* node. Participant 4 viewed the enhanced mark and evaluated its state as well as the surface the mark was on.

A verbal node could only be coded should the examiner make specific reference to it. Where participant 4 conducted an examination of the surface that surface's construction and the enhanced marks could be commented

upon and evaluated. This supported the decision to remove the node *Identifies Forensic Evidence* from the *Physical* node category to the *Verbal* node group. NVivo 9 allowed patterns or clusters to form, however it does not offer the capability to offer some degree of statistical significance of two or more clusters being related. The overall sample size and number of specific crime types being examined is beyond the scope of this study; what is present are clusters and a qualitative grasp of the strength of these clusters. Whilst each of the participants has many nodes in agreement the differences also illuminate investigator practice that could easily be practised by the other participants or more importantly afford some attention as an ingredient for where the focus should be in developing the forensic practitioner.

Figure 3.31 is an amalgam of the clusters represented by all four participants. Nodes *Documentation* and *Preservation* were clustered with a Jaccard's Coefficient measure of strength recorded as being 0.62. This same level of strength was observed for the clustered nodes *Gather information from sources* and *Communication*. The nodes *Identifies forensic evidence*, *Resource Selection or Preparation*, *Strategy*, *Visual Search or examination* and *Analyse* were also clustered. The greatest level of strength was between the latter two nodes *Visual Search* and *Analyse* (Jaccard's result of 0.80). This is interesting as it connects with the reflection statements where the analysis of a surface was related to the evaluation of that forensic product. The overall results for each participant now suggest when this analysis occurs.

Visually searching the scene or visually examining an object has a certain level of complexity associated with it. That is to say more is happening in this phase than simply looking for forensic evidence. Indeed it is not that items for forensic evidence are being sort out, instead it is a process to select surfaces that will be suitable for a physical forensic examination. Justifications and strategies to deal with the crime scene environment erupt out of this particular phase. This is interesting as it connects with distributed cognition theory (Baber *et al.* 2006) and how crime scene examinations unfold.

Moreover it also links back to the early eye-tracker work and the comments (Figure 3.7) produced by the expert group.

#### **4.6 Examples of clustered practice.**

Nodes that cluster for each of the participants have been outlined above, as have the general or generic similarities shared by the participants. Specific examples of when these occur can also be examined. This examination allows the crime type, the location and general surroundings to be studied; the following will present an analytical interpretation of these conditions. Coding stripes were selected on NVivo 9 which allowed observation of when two or more different nodes were selected over a defined section of coded footage.

##### **4.6.1 A study of the clustered nodes: *Communication and Gather Information***

Communication occurred in many instances and crime types, although more frequently at a crime scene rather than dealing with recovered property in a laboratory setting. Where participants did communicate in the laboratory it was not connected principally with the crime enquiry but instead centred around how forensic evidence could be recovered or more generally how one should approach a particular forensic examination. This node also represented an opportunity to confirm information either from the aggrieved party, colleague or attending police officer. This information could be related to a first account of when the event happened to more specific information.

Participant 2 during the examination of an outbuilding is persistent in tying down the information she believes is correct; in this instance it was after the examination of a padlock. The aggrieved party is willing to help but also

wishes to not be seen to have judgement passed on the security of his premises.

VCSI: Right and the lock, usually the lock is insecure isn't it?

IP: Aye the pad

VCSI: There's another way in isn't there, round there.

IP: Yeah there is

VCSI: Is this gate locked and secure?

IP: Well it's shut.

VCSI: But it doesn't have a lock.

IP: It has a bolt on but the gate swelled.

Communication appears to be pivotal in understand the events, making sense of what has happened. There are times as evidenced above when questioning needs to be persistent with different questions being proposed to confirm or challenge existing knowledge. Whilst many examples relate to this point, this same approach is also noted when the attending police officer and not the IP discusses the events with the examiner. For example participant 1 at the scene of a burglary to a public house discusses the method of entry with a police officer.

*VCSI 1: So this just goes out onto the street*

*Police Officer: Aye (police officer handles a padlock) That's been left open.*

The Police Officer explains that the padlock was on but not closed, the explanation is a combination of verbal and visual communication, acting out proposed actions of the offenders. The VCSI quickly establishes that the large doors leading to the street were not left open but instead directs the following comment to the aggrieved party:

*so it's been left insecure.*

Here 'open' and 'insecure' have different meanings. The first portrays an image of being open, ajar the other closed but has the potential to be opened without force.

Participant 2:

VCSI: *Can I just ask was the door locked, - (pause) yes?*

IP: *Yeah but the catch has come off.*

VCSI: *Right so it has been forced open yeah.*

The VCSIs also use this opportunity to ascertain what was moved, not just how entry was gained, phrases such as:

VCSI: *Do you know if anything was moved to get access to the bike?*

This questioning assists in targeting what needs to be examined but also ensures that other innocuous items are not overlooked. Participant 4 uses a different strategy by making a distinction between what has been *disturbed* (within the vehicle) and what has been *taken* or stolen.

*Anything disturbed in the vehicle other than in the boot? Right nothing taken from in there? IP: Taken, a couple of CD's.*

By using these different phrases a better assessment of the events can be determined which in turn governs the examination phase.

This is an important part of the process and connects with earlier off camera comments by an expert examiner during the eye-tracking work,

*I wouldn't examine a property unless the IP was present.*

In the above example participant 2 was attending the crime scene in company with participant 1, participant one also had a detailed discussion with the IP although in a different capacity. Here the communication and gathering of information was not situated in a forensic context but instead in relation to providing crime report details, a key aspect of the work by the VCSI and one not often captured using the head-mounted camera.

Participant 1 asked a number of questions in reference to the make, model, colour, value of the item stolen, cost of repair and knowledge of potential suspects. In this example participant 2 continued with the crime scene examination and where appropriate questions were again confirmatory in nature.

VCSI 2: *And you say that petrol can was inside?*

Additional questions also concerned potential sources of fingerprints or indeed their destruction.

In a separate incident participant 2 asks if a collection of alcohol cans have also been moved. Here questioning is misunderstood by the aggrieved party however the quick justification of the questioning is received and stimulates further actions as the aggrieved party realises what else has been moved.

VCSI 2: *Is that your fosters tin as well?*

IP: *Aye that was mine sorry*

VCSI 2: *No don't worry I don't judge so, obviously I'm trying to find out things they might have touched, might have moved, might have drank from or anything like that just."*

VCSI 2: *Do you know if your partner's been in the shed?... She didn't touch anything?*

Participant 4 also begins by ascertaining what has been moved, almost immediately, the sound of her crime scene case can be heard in the background suggesting that this is one of the first stages to her examination. Here participant 4 wishes to home in on specific and relevant areas within the vehicle, making sure that the information that has been presented is secure; this then steers the examination strategy.

VCSI 4: *Do you know if anything has been disturbed from the front of the vehicle at all?*

IP: *No*

VCSI 4: *Nothing at all so it's literally they've broken the window and...*

VCSI 4: *The books in here, are they in the places they would have been?*

Examples of inquiry were observed irrespective of whether the scene was an outbuilding or vehicle. Participant 4 also used this same questioning approach for a single article: an incident involving an assault on a young boy with his skateboard draws the following question:

*Right so when they grabbed the skateboard off ya, how did they grab it, was it at the bottom was like that?*

The aggrieved party understands the question but not the protocol

*It was*

and begins to explain, the VCSI cuts in and says

*Sorry just don't touch.*

*IP: Oh.*

Participant 4 continues with her explanation of how the board might have been touched. This in turn allows her to hold the board and yet still retain the potential of recovering the evidence on the surface.

Participant 2 also explains what forensic examination is possible and tries to manage the aggrieved party's expectation,

*I'll try and put some powder on it, but with it being wood, erm fingerprint powders are quite unsuccessful, erm but with it being quite high gloss and quite a smooth finish, I'll try...*

Participant 4 also ensures that the result and the reasons for the result are explained.

*Looking at the items in the book there isn't anything I can get forensically.*

The Volume Crime Scene Investigator also communicates her past actions and future actions along with the potential impact on further damage. The example here uses fingerprint powder and lifting media. The examiner is also seeking permission should the possibility of the lifting media damage further the surface on which the mark is positioned. In this example the offenders have reversed a vehicle up against wooden garage doors, forcing the lock off the inside.

*VCSI 4: I've just taken some photo's and I've taken a sample of the paint ok what that means, I've gone right down to the wood but I've taken the transfer off the van as well... I'm gonna have a look and see if there's any fingerprints or anything...Erm just as a pre-warning, because it's quite old paint...(IP: hmm) it might peel the paint off alright. (IP: that's fine).*

Examples are also present where the IP wishes to make the circumstances clear but also what requires an examination by the VCSI.

*IP: All them panels been piled up there*

*VCSI 4: Right ok so they've been moved as well yeah.*

*IP: Aye, (inaudible) you know.*

*VCSI 4: Right ok no problem*



IP: All this has been moved...Touched you know what I mean?

Within this scene the examiner works hard to ascertain how new the footwear marks are in the sand. Here the injured parties attempt to help by saying the footwear are not the same pattern as his but it is only after persistent questioning that it is established that the girlfriend of the IP may have had access to the garage.

There are also instances when the examiner appreciates what forensic evidence needs to be collected, moreover they are also aware of its significance even if the packaging or documentation is not always clear in their mind. Participant 3 provides an example of this as she examines a vehicle used in the commission of a robbery. A hat and wig belonging to the offenders is observed however whether they should be packaged together is raised as a question with a more experienced colleague. Here communication is not concerned with what to examine or establishing where offenders have been or items touched but related to the recovery of evidence. Other examples also explored this aspect as the Volume Crime Examiner discusses what to examine and recover via telephone conversations. These present a different point of view on *Communication* and *Gathering Information*. Examples of this type are infrequent since examinations are carried out individually or conversations about practice occur off camera. Instances are more likely when examining property at the police laboratory however this was not through structured or deliberate action. These ad hoc occurrences passed on tacit knowledge and are described in the interview themes as a separate heading later in this section.

*Communication* and *Gathering Information* also captures the actions of the injured party. In many of the instances viewed information was elicited as to their handling of the items. The function of this element in the examination process is critical to understand the events either prior to or during the early stages of an examination. Where the scene is analysed or where sense is made of the events, communication is necessary to gather information and challenge existing information. Expectations are managed and reasons for the specific crime scene actions are expressed even to the point of ethical

implications such as the further damaging of property in the recovery or enhancement of forensic evidence. Examples even include examiners enquiring about the cost of items moved or stolen, these requests are common but their purpose is not always to simply record information for a crime report but instead to engage and create a rapport with those at the crime scene. Examples captured demonstrate a sympathetic and sometimes empathetic understanding of what has happened. One examiner makes comment to having been a victim of crime herself. Rapport extends to the sharing of humour such as discussing a stolen scratched CD.

It should be stated that there were many more recorded instances of coded video and audio for the node, *Gathering Information* where communication was not present with another party, however communication was necessary to gather the information. Here the examiner comments *aloud* why specific actions are necessary and are related to a previous conversation off camera with the injured party. These comments often began with the “IP states”. From this it is sensible to deduce that the strength of the cluster is much higher than that reported. Many more examples exist but were not captured and consequently not coded.

The importance of effective communication by the examiner is not surprising and that a similar observation is present in the list of National Occupational Standards. However what is not present are specific examples, and guidance of what to look for, or indeed what skills are important to develop to promote it including when this communication could take place in the examination phase. Appreciating that the victim and the examiner may not share the same interpretation of words or understand their significance, such as ‘stolen’ and ‘moved’. Whilst no clues exist to suggest objects were moved the mere fact items were stolen brings into place opportunities to examine specific locations that would otherwise go unexamined.

Earlier reference to the nursing domain allowed expertise and expert performance literature to present methods of data collection and analysis, with further literature centred on effective reflection. From an analysis of the

above clusters the crime scene domain has more in common with medicine, where medical student education is steered through reflective thinking whilst gathering information through history-taking (Hulsman, Harmsen, and Fabriek, 2009). The route to taking a patient's history and having a caring approach are akin to the comments produced by the forensic examiners where sympathy is part and parcel of information gathering. Furthermore non-verbal communication is captured that also provides support to a caring approach; the examiners demonstrated they were listening by nodding their head. These examples are clearly captured using the head-mounted camera.

#### **4.6.2 A study of the clustered nodes:**

##### ***Documentation/Preservation/Recovery and Packaging of exhibits.***

The spatial plots also expose the limitations of the eye-tracker work in that the method or approaches by the expert group could never mimic the real world environment as they were not asked to carry out a crime scene examination, merely a visual examination and search. Visual examinations do not appear to occur in a separate phase but instead are clustered around other nodes, with different clusters becoming apparent depending on the type of work being done, for example fingerprinting and identifying forensic evidence with a strong emphasis on evaluation. The eye-tracker experiment needed to control for differences between the two groups however in doing so it is suggested that even more complex patterns of behaviour were not revealed since the expert group were refrained from carrying out an examination in the conventional sense. As different aspects of practice come into play different and more elaborate sense is made of the environment.

Participant 2 prepares for the recovery of potential DNA material, in this example swabs are selected, and checked before swabbing begins. The examiner also includes control swabs. Documentation occurs on the swabs themselves, each one is labeled up in turn. The examiner uses a lumo-colour pen to record her details, such as exhibit number, date, location and

description. Documentation is not included on the scenes of crime report form.

*That's my unopened swab, I'm then gonna do a water control*

*VCSI works on swabs (57 second pause)*

*And then I'll swab inside and outside of the rim*

*VCSI continues working on swabs (49 second pause)*

Participant 2 and Participant 4 attend the scene of a burglary, here participant 2 places arrow markers next to the enhanced fingerprints. These markers are placed to assist in establishing the location and orientation of the fingerprints, these are all subsequently photographed.

There is significant importance in ensuring the location and identification of each exhibit.

*Participant 2: Lift from office door.*

Documentation has its own language, the recording of exhibits is precise; the style is clipped in much the same way as an academic paper is cited in a reference. Every fingerprint lift has all the details recorded at the time.

Examples also contained reference to another node: *Gelatine lifting*. This node was initially grouped under the node *Preserve, Recover and Package*; however the activity surrounding this has a number of dimensions.

It should be noted that of all 45 document references only one shows the examiner completing the crime scene report form. It is possible to be clear when crime scene note taking occurs as the timing is discussed in the interview. It is often the last action in the video; where the examiner is seen walking to the scenes of crime vehicle and comments on camera that the notes are "*all to do*".

Items may also need to be recovered for further forensic examination, e.g. participant 2 spends a considerable time removing parcel tape from a vessel, this tape is then placed sticky side up. Great care and attention was taken as the item was placed into a box. At this moment the documentation was completed on the box and exhibit label.

Participant 2 removes the red cellotape from a glass bottle for chemical fingerprint treatment, the VCSI tries a couple of boxes for size, the moment the tape is secured in the box the documentation begins.

*Erm I've managed to stick down this piece of cling film and tape flat, just put little tiny pieces of cellotape just to secure it down, now I'm just going to move onto erm the other glass to get this cling film off there...make a note so that's AO1*

*Participant 2: "That's lifted really well, I can see the mark very well"*

Note an evaluation of the mark is also carried out, a feature to be explained later.



Figure 4.1 VCSI writes on an acetate sheet as fibres are recovered from a section of insulation style tape.



Figure 4.2 VCSI documents gel lifts on a tilt top garage door: directional arrow applied.



Figure 4.3 Documentation is applied to a box: post gelatine lift.



Figure 4.4 Still photograph of VCSI filling out a CJA label

VCSI completes the continuity to say she has handled the item.

*Item has been re-sealed back into plastic knife tube, (name of police service) police seal placed over the top and I'm about to sign the continuity to say that I've actually handled the item.*

Here item is resealed in its original packaging.



**Figure 4.5 Participant 1 filling out the CJA label on evidence bag**

*Right so I'll seal up that package and find the continuity, there's one exhibit left*



**Figure 4.6 VCSI completing documentation on fingerprint lift**

*.... Erm I'm just in Alpha 5 laboratory and I'm just going to examine some property. The first property, it's an empty Belle Brusco Bianco bottle which apparently has been thrown through somebody's front window. There has been two suspects named... I'm gonna examine it for fingerprints and for possible DNA. I've begun by filling in the continuity, just with my name, initials, date and signature, which I'm just going to put over there now.*



Figure 4.7 VCSI writing a direction arrow on the lifting tape.



Figure 4.8 VCSI writes on the swab tube.



Figure 4.9 VCSI documents lifting tape with a directional arrow.



### 4.6.3 A study of the clustered nodes: *Powdering and Evaluation*

The node *Powdering* was clustered differently for each participant, although one participant (participant 4) had many frequencies of where powdering was clustered with the *Evaluate* node, and participant 3 had the *Powdering* node cluster with *Identifies Forensic Evidence*. The sheer number of frequencies for participant 4 arguably influenced the final spatial plot presenting all four participants. That said where powdering did occur individual examples showed that it featured with *resource selection and recovery* and it should be appreciated that even participant 3 who has a different spatial cluster for powdering provided examples where powdering was accompanied with the Evaluation node. This does suggest that participant 4 was not solely responsible for the overarching cluster.

#### Participant 3

*Nope, absolutely nothing on there*

*VCSI powders the box (1 minute 26 second pause)*

*Strategy* and *Analyse* were often clustered, and at this juncture it is worth commenting that when powdering, these nodes had an influence and governed or steered the powdering process.

#### Participant 3

*I'm going to use aluminium powder erm as the door is erm grainy wood, painted door. I'll do the door first, possibly just...*

*in order to get the most contrast I will use bio-chromactic powder.*

The prior presentation of *Strategy* as a node is unsurprising however the structure of the strategy or formulation of what is required can be different. The above example decided on what powder to use whilst in other examples the very reason for moving forward to the fingerprint phase is justified.

*there's nothing on the rock so I can't examine it, erm so I'm going to go ahead, start with the fingerprint exam,"*

*I'm going to test the area of this handle to see if it's a suitable surface*

*VCSI continues powdering the items (3 minutes, 6 second pause)*

*Just going to test this cardboard box to see how the powder's going to work on it...no it's too ridged (Participant 3)*

#### Participant 4

*The weather at the moment is actually about minus one so it is fairly chilly, erm fingerprints may not persist in this kind of weather. Right*

#### Participant 4

*Nothing coming up on the actual wing mirrors at all unfortunately, just going to have a look at some of the footwear we can see away*

*Very doubtful this is going to pick up any fingerprint detail, just being on the surface type,*

It is anticipated that the chance of a mark developing is remote, this down to the nature of the surface. The analysis of the surface can occur prior to the examination. However there are times when it occurs during the examination.

*Anything of any kind of value, nope, no details visible on this particular box*

*Again it is quite textured but there might be something, we'll have a look with some magnets*

Participant 3 also evaluates whilst powdering but in this instance she evaluates her performance and not the quality of the mark

*over powdered my brush a bit.*

This is a different form of evaluation. The evaluation of the mark may be due to a number of factors, possible over or under powdering although this is not always attributed to performance, more often the simple state of how it appears.

Further instances show that participant 1 converses with the aggrieved party as he comes out to the vehicle for an update, here the VCSI appraises him of what she has found, all whilst powdering.

*there was a mark there, erm it doesn't seem to have been enhanced anymore by the powder. I'm beginning to think that it's not a fingerprint mark and just a mark in the wood, but I'll keep going, see if I can get anything at all. It's quite textured this wood,*

*it's just going all into the grain*

Participant 3 questions the IP whilst fingerprinting. Gathering information also does not seem to stop and start but is continuous throughout the phase of the examination.

*...there is a mark on there but it looks a bit too smudged to get any detail from, accurate detail.*

*Nope, absolutely nothing on there*

*Oh it's too grainy inside*

*No, nothing on that*

*Bottom side is dirty VCSI finishes powdering (43 second pause)*

*VCSI: Do you mind if I put a bit of powder on your door? It's not permanent, it's easy washed off with just soap and water is that alright? Got a nice smooth surface*

*Right, what I'm going to do, I'm going to lift just that area of the handle there as there's visible detail, it seems to be overlapping detail, but there's visible detail and can see a few, a few marks so I'll be lifting that. There's nothing on the other piece of equipment so we know what that is...garden waste, and there's nothing on the tray and the mirrors wet. Erm there was no DNA or trace, erm there's no footwear, erm what I'll do is take eliminations from the IP as well*

*That's lifted really well, I can see the mark very well. Right I got some prints there, they're quite showing,*

Participant 4

*Nothing coming up on the actual wing mirrors at all unfortunately,*

*Very doubtful this is going to pick up any fingerprint detail, just being on the surface type,*

*Anything of any kind of value, nope, no details visible on this particular"*

*Examination using the powder negative*

*Very slight detail on the erm insufficient for any sort of comparison*

*The IP's husband has actually erm repaired the garage as well so, right there's nothing coming up with the magneto powder so far*

*Right there's some smudges showing up, there's no visible detail on those smudges*

*Yeah there's a very slight partial there but it's not enough detail for any kind of lifting*

*Yeah there's definitely no detail coming up on there*

Participant 1

*There's nothing coming up, there a bit there but it doesn't even look like a fingerprint mark to be quite honest, there's no detail at all*

*Right there doesn't seem to be any marks as such coming up; I know I just said before that there was a mark there, erm it doesn't seem to have been enhanced anymore by the powder. I'm beginning to think that it's not a fingerprint mark and just a mark in the wood,*

16:52 I mean you can see that there's no detail in those at all...they're just smudges, they maybe had gloves on, obviously with them messing about with radiators and that

### Participant 3

*Hmm it's all just going into the grain*

2:33 *There's a mark on there but it does look a bit too smudged to be able to get any detail from, accurate detail*

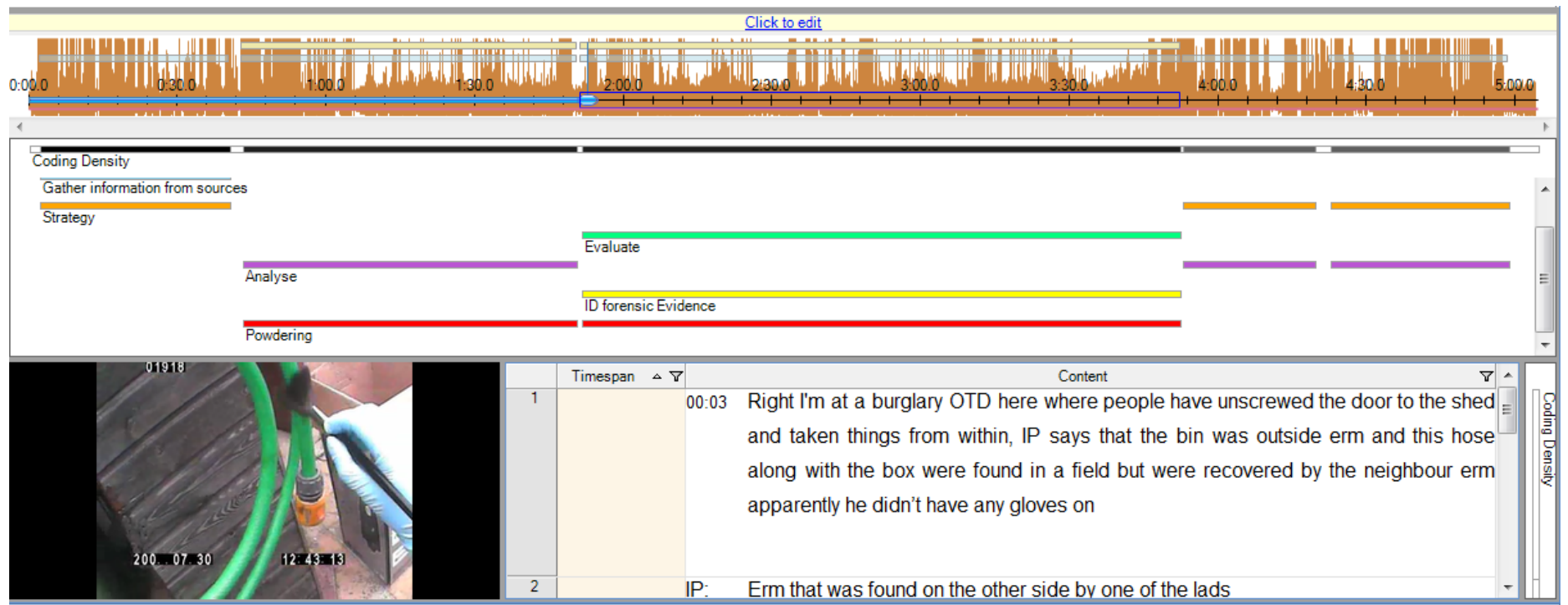


Figure 4.10 Screen shot displaying coding stripes 'Evaluate, Powdering and ID Forensic Evidence'

NVivo 9 does not have a sequence option, that is to say it is unable to connect coded nodes prior and post the specific node in question and display these in a grid format. It is also not possible to request a query search on the coded sequencing, instead the user has to visually inspect the coding stripes presented in their individual window (Figure 4.10). Coding stripes highlight the order of coded information. Therefore some sense of order of actions is possible. The node *Strategy* frequently came before *Powdering* and unsurprisingly the node *Preservation, recovery and packaging* came after the observation of a fingerprint. Moreover once a fingerprint was observed the coding of the node *Identifies forensic evidence* was a natural progression. Coding of large sections was not done, as this would result in an abnormally large number of clustered nodes. In examining video and audio data the objective is to see what patterns are occurring and specifically at what junction do physical and verbal nodes overlap. The node *Analyse* was also seen prior and post powdering. This is unsurprising as the analysis of the surface and surroundings steered the strategy on what to do next in many different ways: for example best or most appropriate fingerprint enhancement method. Furthermore the evaluation of the fingerprints, were also justified through an analysis of the surface. Should a mark be described as a smudge or containing insufficient detail, it was often explained or related to the surface type. This required an analysis of its morphology, or environmental factors which could impact on getting a mark.

It cannot be ignored that a feature to present spatially a sequential cluster of tasks would be welcomed. What is apparent however and it is perhaps most apparent with the node *powdering* is that the examination process is not linear that is to say progressive from one distinct phase to another. Photography, through to forensic recovery through to fingerprinting is loosely present. Photography is spliced though out the examination, moreover fingerprint recovery cannot be thought of as an isolated aspect of the work since gel lifters were used to recover latent marks. The conscious thought of fingerprint recovery is not merely positioned as being mindful of where and

how to handle an object but also requires thought as to how the scene should be approached.

Gel lifting is clustered by participant 2; with the node photography.

Photography is used to record the location of the gel lifts which in turn explains this cluster. Practice for the other participants is such that this is not always adhered to, although as participant 4 comments in the interview, it should be carried out.

VCSI: *Theoretically you should photograph if you get gels as well but nobody does*

Through viewing the clusters it is possible to suggest that some participants gel more than others in their pursuit in finding fingermarks whilst others prefer to powder for latent fingermarks. Moreover this puts forward a hypothesis as to why participant 4 is able to cluster *powdering* with *evaluation*, since the marks are made patent. Participant 4 also explained in her interview that the gel lifter is not 'trusted' by many of the more seasoned examiners in the department. Differences in practices emerge and are governed by an examiners own ontological position on what they believe to be true, correct or easier. Variation exists but these are subtle, it may not manifest in the product that is to say a photographic image or packaging, instead it concerns the approach to the investigation.

#### 4.6.4 A study of the clustered nodes: *Analyse, Visual searching/examination, Strategy and Resource selection/preparation.*

The above nodes were clustered together by participant 2, three of the four nodes were clustered for participants 1 and 4 and two were clustered by participant 3. Irrespective of the clustering frequency the above nodes feature in all the examiners work to a greater or lesser degree and are some of the most coded nodes. The nodes naturally lend themselves to work together, the node Resource selection/preparation relates to resources that the examiner chooses from their equipment or vehicle and also includes the preparation of that resource. Initially this node was separated out into two distinct categories however in many instances the work carried out by the

examiner was seamless. Examples include retrieving a box from the scenes of crime van and the moment it is selected it is folded into shape. In the case of property, brown paper was placed onto the surface in the forensic examination laboratory prior to commencing with the visual and forensic examination. It should also be stated that this occurred more times than recorded as the examiners in many of the scenes turned the head-mounted camera on only when the initial preparation had been completed.

This node also included the retrieval of photographic and fingerprint equipment as well as getting packaging material and lifting media, in particular tape and gelatine lifters. Other examples include the use of specialist light and magnifying sources to visually examine a surface. The retrieval of resources and preparation was also combined as a single node as it better explained instances where health and safety products were used, since these examples are regarded as preparation for a task. The examiner rarely made mention of these events; this part of the examination phase show moments where the examiner is so fluid in their operation that overt descriptions are forgotten. Where reference was made to health and safety these involved wearing a mask, both participant 1 and participant 2 independently of each other commented on the fingerprint powder as a hazard as well as having the additional benefit of preserving and not contaminating potential DNA.

Participant 2

*I'm going to put a mask on as I'm working inside and found that powder is quite affecting my chest. Also it will be good, this will be good if I find any DNA obviously...*

Preparation of surfaces and equipment in many instances will be overt and should the examiner fail to comment the head-mounted camera was able to visually record this preparation.

Participant 2:

*I'm using a clean, decontaminated surface and I'm going to use un-used brown paper to put on the surface to examine my property*



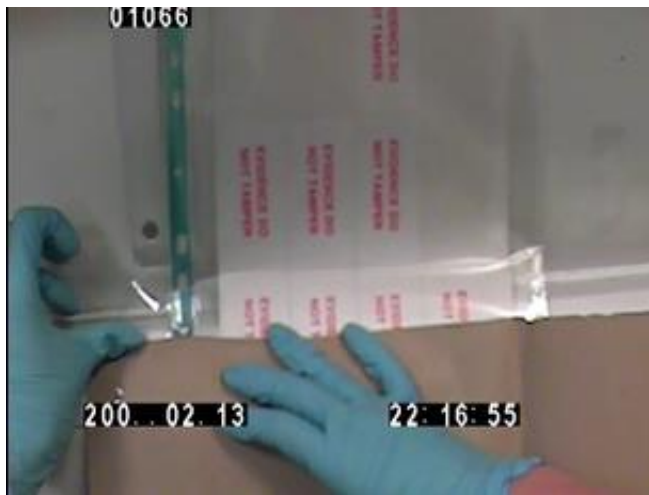


Figure 4.11 VCSI prepares the surface prior to the examination



Figure 4.12 VCSI selects the appropriate lifting medium

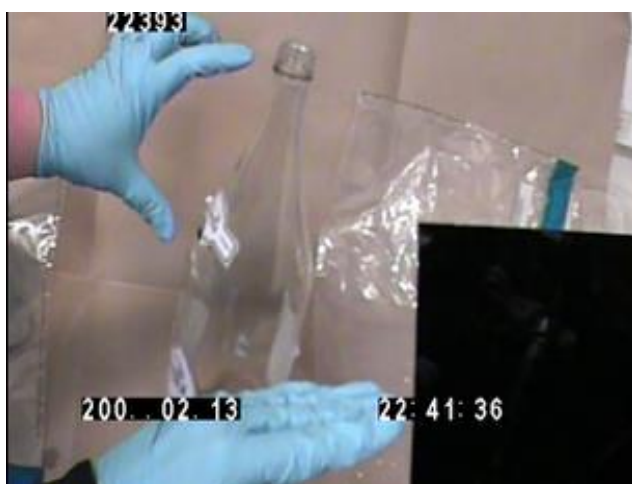


Figure 4.13 VCSI measures out the amount of gelatine lifter required.



Figure 4.14 VCSI searches the object using a torch



Figure 4.15 VCSI selects and begins using magneta powder



Figure 4.16 VCSI searches through her crime scene case for a resource

This preparation was often simply obtaining an article from a storage area however there were instances that involved discussion or prediction of future processes, that is to say without this thought, the evidence may not be recovered or stored appropriately.

For example participant 2 measures the amount of gel needed by placing it against the side of the surface to be lifted or offering it up to the article to gain an approximation of how much is required and where the marks are likely to be positioned. On determining the size needed, the examiner decides to make up the box first. This in itself is regarded as a strategy with the action coded under *Resource selection/preparation*.

Participant 1

*Right, so I've got my gel lifter ready. I've got my box ready and I'm just going to proceed to gel off the bottle now.*

Participant 4:

*...right I'm just having a look quickly to see if there's any, any trace evidence like fibres or DNA or anything like that and then what we'll do is see if there's any kind of fingerprints available*

Participant 4

*As you can see I've put a clean bag down over the work surface, just going to pop my gloves on and we'll get to opening"*

*"just going to pop some gloves on and we'll start the examination*

Instances of *Resource selection* often related to the powder and brush combination and to building rapport with the IP. In one instance the VCSI (participant 4) explains this to the aggrieved party. The aggrieved party asks about whether it is like:

what you see on the television" *"It's very hard to get a print... reply*

*"no": head camera is shaken to give non-verbal communication.*

*It is if someone has touched it, and the surface is right and we've got the right powder and umm. (Laughs). Wish it was as easy as it is on the tele*



Figure 4.17 Participant 4 selects resources (gloves) prior to the examination



Figure 4.18 Participant 1 selects resources (plastic bag) from the crime scene case



Figure 4.19 Participant 1 selects resources (torch) from the crime scene case

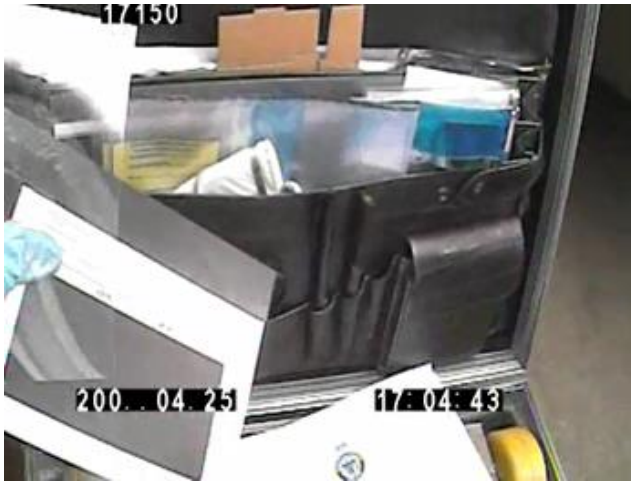


Figure 4.20 Participant 1 selects resources (a fingerprint template)



Figure 4.21 Participant 1 selects resources (a fingerprint brush)



Figure 4.22 Participant 3 selects resources (swabs)



Figure 4.23 Participant 3 selects and prepares resources (camera)



Figure 4.24 Participant 3 prepares packaging material



Figure 4.25 Participant 3 tapes and recovers fibres from a vehicle seat

VCSI were always engaged in searching or examining, these terms do indeed have different meanings or perhaps better described as having different levels of inspection. A visual search tendered to be general, gaining an overall appreciation of the surroundings, ascertaining the space and size of the crime scene or object. A visual examination was more focussed, specific to a location on the object or within the crime scene. Both of these visual inspections often involved the use of a torch or other resources such as a fingerprint brush. It was not possible to always be clear what constituted a search or examination; these were often dependent on what the VCSI wanted to view and were not always made overt. Whilst there were times when it was possible to demarcate these, overall this particular node can be regarded as simply visually inspecting the scene or object. Nevertheless the node is labelled to include that finer level of visual inspection.

It is perhaps unsurprising that this node will be clustered with *Resource selection/preparation* as fingerprint work requires a good degree of observation close to the surface. This node could quite well have been coded with many other nodes. However as explained the coding was segmented, in that specific aspects of work were coded together to compensate for NVivo 9 failing to have a sequencing cluster, or options to denote which nodes followed each other, other than which nodes were merely clustered together at a particular point in the video.

From the view of the examiners the evaluation node was clustered with the visual searching/and examination node; these references largely related to the evaluation of fingerprint marks, that is their quality and suitability for submission or uploading onto the IDent 1 fingerprint database. Other examples focused on similar evidence types such as footwear marks; nevertheless the evaluation node was unsurprisingly connected with the visual examination and searching of property or crime scenes.

One constant through the examination of the spatial plots was the clustered nodes *Visual searching/examination* and the *Analyse* node. These were clustered for all of the participants. In addition to these clustered nodes was

also the *Strategy* node for three out of the four participants. It can be suggested therefore that, as examiners observe their environment, they make sense of it and construct strategies on how to deal with what is required. It is appropriate to therefore explore what is meant by strategies, however prior to exploring this node it is necessary to ascertain what examples flesh out the *Analyse* node. What analysis is occurring and when this occurs is fundamental moreover this and the above exploration of the clustered nodes begin to formulate ideas on where the perspective should be for developing the Volume Crime Scene Investigator. In addition these examples and the sense made of them also have the potential to align themselves with specific National Occupational Standards in this area. The examples from the clustered nodes provide the sub text and exemplars or a standard which can be measured and moderated, for example:

Participant 2:

*I can see from the bag that the bottle is wet, I'm trying to hold it at the neck of the bottle 'cos I'm going to swab the rim. It's a shame the bottle's wet 'cos it'll be great to fingerprint from. I'm just going to have a look anyway to see if there is anything we could gel lift*



5 All four VCSIs combined

Analyse Beth - 13.2.10 - socket 02809.10

Click to edit

0:00.0 3:20.0 6:40.0 10:00.0 13:20.0 16:40.0 20:00.0 23:20.0 26:40.0 30:00.0 33:20.0 36:40.0

Coding Density

Strategy

Evaluate

Analyse

Preserve Recover Package Exhibits

Photography

Timespan	Content
26 24:51.0 - 25:48.0	Right I'm just having a look at erm the bottle itself, see if it's dried out which I think it is. I'm just going to do a test area erm for the powder, see how it does on the surface, see how it reacts with the moisture. Erm I use scroll hair and aluminium powder which will be that one  <i>VCSI pulls out brush and powder (30 second pause)</i>
27 25:48.0 - 28:37.0	Right I'm just going to test this bottom area here

400 02:13 22:50:55

Coding Density

Figure 4.26 NVivo 9 screen shot showing multiple coding for a section of video

Figure 4.26 presents data for participant 2, it is apparent that there is a mixture of *analysis* and *strategy* statements under the same section of video. This is a further example why it is not possible to separate out nodes into distinct boxes when coding since one node does not always naturally distinguish itself from another. Instead the boundaries are blurred with many statements or physical actions being a blend, this is where NVivo 9 can code a number of nodes at the same time.

Statements often included a description of the item or a generic description

Participant 2:

*first aid style box of plasters.*

Description of an item or location was initially recorded in a separate node labelled as Description, however in many of the original descriptions there was a strong analysis component. Furthermore it was through some form of analysis carried out by the examiner that resulted in a description.

Participant 2

*I can see from the bag that the bottle is wet. "That side is dirty".*

This example relates to the condition of the object, which has evaluation components attached to it although these are often tacit and expressed through the analysis, in that 'dirty' suggests that opportunities for fingerprint recovery will be poor.

Participant 2:

*Erm shed is a black like polish erm variety, obviously damage there to the lock, erm can't do much with that, there's too much damage with wear and tear. There's no visible DNA trace, erm there's no footwear as erm the ground is concreted. I'm just going to try and go in.*

Participant 4

*Fair enough the weather is really cold like I say if there were any fingerprints they would have degraded anyway.*

Response to working with Participant 2. Participant 2 states that no marks found on a shed door.

Participant 2:

*vehicle: "Is still wet there, I will need to be careful when I do my fingerprint examination." ... "I can see marks where it has been cleaned" vehicle has been valeted. ... "no scope for footwear, floor is carpeted"*

Examiner states that she will examine the car with black powder as the colour of the car is silver, the windows will be powdered with aluminium powder as the windows are glass. However she states that she will not examine the finishing to the inside of the door as these are leatherette type surface and the powder will just bring up that pattern.

Participant 2:

*I'm going to use aluminium powder erm as the door is erm grainy wood, painted door. I'll do the door ...Not going to fingerprint the door handle as it's a brass, full of wear and tear and all scratched"*

*"There's no scope erm for footwear as you can see the road surface erm is concreted...Erm and there's no scope for footwear inside the vehicle as erm it's carpeted,*

Participant 4

The powder I'm going to use is aluminium powder erm mainly because it's a nice smooth surface and erm the silver colour of the ally powder should contrast well with the colour of the vehicle

Participant 4

*The item is a black plastic handled flat head screw driver, some damage to the handle area, fairly degraded surface....Item does not appear to be suitable for fingerprinting due to the surface type*

*I'm just gonna finish dusting the rest of the box which I don't think is gonna pick anything up with it being corrugated cardboard, I'm just going to try the tape erm, like I say I'm using magneto powder at the moment*

It can be seen that *strategy* statements are connected with analysis statements in much the same way as *evaluations* statements are. The analysis provides the reason (or justification) for action, and decisions or in the case of evaluations: these become judgements.

*Now there's multiple marks on the side of the door here...so*

*Actually there's one there so what I'm going to do, that looks like a, erm I've decided to take erm a gel lift of the area of the door here*

*Erm I'm just going to have a quick visual, can is metal...and quite rusty and old, obviously with a bit of residue here at the top which has hardened*

#### Participant 4

*Cowling section seems relevantly dusty on the inside, obviously grain surface on the exterior*

This last comment is interesting as it reinforces the evaluation of the evidence (or lack of evidence), the term 'obviously' is used when describing the cowling. The textured surface rules out any opportunity for onsite fingerprint enhancement or indeed any form of enhancement at all.

*boxes from tool (inaudible) erm slightly damp in texture, I'm going to send them off for chemical but they will need to be dried at the station first*

Having an understanding of the surface is necessary in order to appraise the home owner of further possible damage caused by the examination. In this example the examiner stresses that the lifting tape could peel paint off from the shed door. She has inspected the surface, has an awareness of her products and predicts a future action, and so asks the aggrieved party for permission, for the work to begin. Moreover in the audio she stresses the word 'could'

*Sorry, just, just taking the lifts now...erm 'cos these lifts are quite adhesive, obviously try and get the most detail erm could possibly pull off a bit of paint, is that alright?*

Analysis needs to also encompass possibilities, just as the examiner conceives that a course of action will result in damaging property this same analysis exists when preparing or packing an exhibit. In this example the VCSI needs to cut a series of green electrical tape for transportation to the fingerprint chemical laboratory. The tape ends need to be cut for them to be placed into a box, however with this strategy comes with it possible damage. This is where an analysis of the events steers that strategy.

*I'm going to sandwich the cut ends between two pieces of acetate as this will eliminate the contamination issues of putting them in a cardboard box...right first end*

VCSI works on the tape (14 minutes, 39 second pause)

Steering strategy is a strong reason for analysing surfaces and conditions.

*Just going to test this cardboard box to see how the powder's going to work on it...no it's too ridged*

It was not possible to record or calculate the time from making an analytical statement to implementing a strategic comment, however it is recognised that this is a further area of study. Perhaps with a hypothesis that shows whether energy and effort invested in analysing the surface is more productive in terms of evidence and intelligence quality.

Coded data into the *Analyse* node also included those instances that took into account the context of the crime scene, the surroundings and how these would influence any evidence found. In this instance the examiner makes sense of the environment and weights up the quality or usefulness of the evidence.

#### Participant 4

*It is actually a public access area anyway so it'll be of little value even if there was but, no nothing at all of value to lift, nothing of any value located at scene, end of examination*

*...Condition of the actual erm tool box, fairly dirty, fairly old, little bit rusty, right let's have a look*

*No marks on the left tyre (inaudible) to suggest nobody's actually stood on it*

#### Comment in relation to fingerprint examinations:

*It is quite a smooth paint so there is a chance that there is something on here*

*Ok the surface is quite smooth so I'm going to put some magneto powder on*

*The post it notes and the wedding ring were inside of the bag so it's unlikely that they've actually been disturbed, they were in the inner pouch*

#### Participant 1

*I'm going to see if there's any visual apparent marks on the car, with the car being black*

*there's nothing else I can really do in here, as the dash and everything is textured so I can't fingerprint examine on that, so I'm just*

*I'm going to use ally powder...obviously with the car being blue it will be a good contrast*

Analysis also hints at reconstruction, it is through sense made of the

environment that reconstruction takes place, moreover the earlier information gathering stage helps to make sense of what is observed and this connects with previous experiences.

Participant 1

*I'll take a Hemastix test again*

*Obviously just 'cos if I say I've done a Hemastix test, erm it's more likely to get authorised at the DNA lab. Again, you can easily quite say it's blood*

In the above example the VCSI acknowledges protocol, it is not simply a matter of knowing what is required to determine the presumptive presence of blood but instead the VCSI also appreciates the decision making of others. She is consciously aware that others have decisions to make on the feasibility of evidence yielding a result. In many areas there are speculative collections where decisions for submission are debated. Should the presumptive test be carried out then the decision making process is less arbitrary, less uncertain and moves to a stage of exploration on a database. There is a prior acceptance of what the stain is likely to be and its general acceptance as being 'blood'. Further examples at this scene note that the VCSI is able to observe what she believes to be apparent fingerprints on a broken rear windscreen wiper. Making sense of the evidence and intelligence is only one facet. She realises that this out of all the evidence will require further specialist photography.

Evaluating future actions, judging quality even when that action has not occurred exposes previous experiences. This scene demonstrated the interconnectivity of: recognises what evidence is, and knowing what can be done against a backdrop of what has happened in the past. This example does not end here, the VCSI also is bound by ethics; a responsibility that whilst she is employed to recover forensic evidence the windscreen wiper perhaps could be repaired and so acknowledges that permission is needed before moving through the above sequence of events and the item being seized for photographic and further forensic work.

Asking permission is not necessarily policy driven, in some instances it is accepted with the aggrieved party being told what is going to occur, the value or worth of objects is determined by the VCSI. In one example the VCSI states that footwear marks on flattened cardboard in an office complex will be taken, the footwear marks are different and need to be recovered. What is going to happen is explained and permission is tacitly understood and accepted. Appreciating the value and worth is perhaps linked to comparative thinking, with decision making based on previous experiences or the value one's self places on the object.

Examiners did not always examine or test the surface morphology of each individual object in the scene, instead they obtained a rapid appreciation of all surfaces before deciding on the best or greatest area of affording evidence.

#### Participant 1

*There's nothing much here I can do inside even though the IP said that they haven't touched anything so basically sort of the only scope for forensic is just going to be on this door, I'll have a quick look now.*

Volume Crime Scene Investigators also spent time analysing the point of entry, even if there was little or no forensic opportunity to be obtained. Analysing a lock may appear insignificant however there are moments when the method of entry by the offender stands out and is different to merely bolt cropping the lock. In essence there was a desire to understand the actions of the offender and report them, even if there is no formal metric to measure the VCSI on this activity.

#### Participant 4

*erm it's a little bit of a strange one 'cos they've actually used a van to access the door... taken various amounts of copper and a wheelie bin,*

#### Participant 3

*the boot has been opened from the inside from the boot catch*

In other examples analysis stimulates evidence that has the potential to be found. Reconstruction again plays a part in what to observe or notice.

Participant. 3

*Looking for any, anything really noticeable, if there's any blood they might have caught themselves...no visible finger marks*

Analysis is therefore more than describing the object. It is about knowing its construction and possible probative value in terms of forensic evidence and how it connects with the crime event.



**Figure 4.27** Folded section of lead and holdall, examined by Participant 3

The above figure shows a section of recovered stolen lead, in this example the supervisor viewing the head camera recording was able to comment and offer his interpretation which was deeper, more analytical than that of the VCSI. He requested to participant 3 that the handles of the holdall be sent for DNA analysis: the lead is heavy, perhaps gloves were not worn to carry the bag, connecting the offender to the lead may not be possible but it may be possible to connect the offender to the bag and to the lead by default.



## Conclusion

This chapter has provided a detailed explanation of the results from both the eye-tracker and field studies. More importantly it has presented the significance of these results and how they allow greater understanding of the processes involved in this work. This thesis has shown where experts and novices differ in their searching strategy including the limitations in using eye-tracker technology. Expanding on, this chapter also presented a reconnection with the literature review (Chapter 1) as a reminder of its content and how now the results are being interpreted how this dense assessment of expertise literature has been useful to not only plot out a course to examine VCSI practice but also how it may be analysed. The template for analysis such as verbal protocol analysis and Grounded Theory has uncovered the dynamic activity of the VCSI.

Reflection played a significant part in this chapter in particularly as the reflection diaries were interpreted however it also demonstrated the value of reflection in developing expertise. More than this the head camera recordings facilitated this process and also allowed for other such as peers, mentors and supervisors to share their reflections and in the process develop the knowledge of the VCSI. Supervisors and mentors offered advice on how to deal with future similar crime scenes. Peers learnt from watching how their colleagues approach and perform specific fingerprint enhancement techniques.

This chapter also demonstrated the power in analysing narratives (Bleakley, 2005) rather than relying on non-parametric statistical tests. The context and meaning held in these narratives was powerful and showed the thinking behind the crime scene examination actions. For example the approach to allotment crime and the differences in how the participants dealt with this crime type. This and other examples flowed out of the unpacking of the verbal and physical nodes. How participants interviewed the victim, how they structured their questions to test what they believed to be true and the

strategies they adopted were made overt. It became apparent that the VCSI participants in this research engaged in much activity that had a humanitarian element, a sense of reassurance that is not easy to spot in key performance indicators across the country or indeed in industry standards. Nevertheless these activities seemed to be valued by the participants, and from their accounts, clearly by the victims as well.

## 5 Chapter 5 Recommendations

### Introduction

This chapter presents six recommendations, the evidence for these recommendations is derived from the detailed literature review in Chapter 1 along with the eye-tracker and head-mounted camera studies.

Recommendations:

#### **5.1.1 A need to better understand forensic practitioner practice before deciding on how to measure it.**

To develop Crime Scene Investigator practice it is first necessary to understand that practice, therefore it is sensible to learn from other domains that have already unpacked this problem. Understanding expertise, recognising it, as well as methods for its elicitation have all been explored by nursing and health therapy professions for over three decades. These occupations work in dynamic environments where practitioners need to make sense of cues and report their observations. This parallels the schematic organisation of crime scene investigation; learning from these professions is necessary to better understand and develop the profession of crime scene examination. This thesis should be the beginning to observing the forensic examiner. There are other avenues which have yet to be explored for example:

- Has investigator practice changed significantly since the recent introduction of the ISO accreditation standards?
- Has the remote transmission of fingermarks changed the sequence or approach to crime scene work in those forces that use this technology, and does this have benefit for **all** forensic samples?

In essence, the observation of this work needs to embrace observational techniques used in other domains and championed by ethnographers and ergonomic specialists. Furthermore, this observation should not be static as new products, processes and external influences seek to change this practice.

### **5.1.2 Appreciating the importance of reflection in developing the forensic practitioner.**

Appreciate the value of 'reflection' in developing the crime scene practitioner and its role in problem solving. Reflection as an action and tool has been discussed in the literature and was evidenced in both the eye-tracker and head-mounted camera studies. Participants provided evidence of reflection in context as well as post examination. Evidence was particularly strong for *reflection in action*, assessing the cues in the environment *in the moment* and being able to rapidly make sense of the situation. National Occupational Standards frequency makes reference to terms such as: 'review, prioritise, assess, establish, take account, appropriate, determine, take relevant measures, ' but with little substance as to what this looks like. This echoes Doak and Assimakopoulos (2010) work on forensic science standard operating procedures, and how a substantial element involves or needing to acquire *tacit knowledge*.

Reflection observed by participants in this thesis was geared around assessing the crime scene, the surfaces within it and the benefit or drawback of those surfaces. More than this, reflection and assessment influenced strategy building on what actions came next in the examination phase. It was possible to supply the context to when conflicting demands warranted prioritising. Using verbal protocol analysis it was possible to understand how an examiner was making a decision but equally paying close attention to other cues that could influence that decision. This was seen in both the eye-tracker and head-mounted camera studies. It has already been highlighted

that reflection is a difficult skill to develop. Consequently, reflection needs to move beyond only using diaries when nurturing this skill, its potency in problem solving needs to be better expressed, understood and discourse on the subject of reflection in crime scene examination is urgently required. Nevertheless, exemplars of when, and how reflection is of benefit could stimulate the forensic examiner to recognise when it is happening during their own practice. The head-mounted camera experiment and accompanying interviews revealed that mentors and supervisors have the potential to stimulate reflection in practitioners. More than this, the recorded videos allowed the scene to be 'revisited' by more experienced practitioners. Here the resulting actions and decisions were debated leading to learning or a growing in confidence; processes initially adopted and found to be correct, simply needed repeating. Other examples showed an exchange of tacit knowledge between the experienced peer and the developing VCSI, consequently a potential change in the examiners practice presents itself. These are real examples of development and should accompany standards in the profession.

### **5.1.3 Value research that assists in providing tools to understand performance.**

Value expertise and expert performance theories as a model or tool to understand how highly proficient crime scene practitioners behave and their approach to understanding their environment. This recommendation is an extension of the first in this series, however it is specific in that those engaged in developing and measuring crime scene examination performance may find it useful to level their practitioners, not just in terms of forensic products but also more subtle examples such as ability to interview, deal with confrontation, crime prevention advice, reassurance given to the public, knowledge of current developments in the profession or self-directed action research. In this last example, a VCSI commented that another practitioner

used gel to recover a forensic sample from a 'bend back' (criminal method of entry to a vehicle by bending back the door edge), and was successful in achieving an identification. This was borne out of the fact the vehicle was wet and as a result conventional fingerprint powders could not be deployed.

#### **5.1.4 Understanding the different stages to being an expert forensic examiner.**

Being able to map and grade performance is useful for practitioner development. Knowing how expertise manifests and why it is problematic to capture, begins to explain why previous attempts to do so have not presented that "*magic bullet*" as described by Kelly (n.d) in Operation Radisson. The difference between an *apprentice*, *journeymen* and *expert* is stark; what is critically important to appreciate is that these terms are transient and not fixed for all tasks. Being a journeyman or expert in the photography of wounds may well be different to those of general crime scene photographic techniques. Here using expertise theory to understand complex tasks is useful and begins to explore the procedures occurring on the micro-scale. It can also be used in conjunction with positivistic data such as metrics that measures practitioners on the number of forensic products recovered or identified. It has the potential to explain top performance, for example forensic practitioners securing larger than average fingerprint identifications. These theories are powerful, understanding them begins to explain why top performing examiners are better and what they may invest in which results in them being better.

Be innovative in observing individual practice; consider using eye-tracking technology for simulated scenes to build a picture of how examiners search and examine. It is recommended that stakeholders concentrate on what is observed and also what is not. This technology can be used for training practitioners as well as a tool to expose high end performance, making overt what is tacit for others to appreciate and if appropriate, mimic or adopt

(Butler, Thompson and Bel, 2013). In real world environments it is recommended to use head-mounted cameras to record this *own point of view*. This thesis showed head-mounted camera equipment to be robust even in harsh environmental conditions as well as being inexpensive to purchase and run. This technology has shown its worth in other domains such as physical therapy and fire-fighting (Omedei and McLennon, 1994; Unsworth, 2001; Parker *et al.* 2008)

To-date head-mounted cameras are part of the equipment many police and community officers wear, however their use in developing the crime scene practitioner and providing evidence for performance measurement in crime scene examiners has not yet been realised. It is recommended that practitioners use these recordings for their own development since these recordings have the capacity to stimulate reflection. Examples from the head camera study showed that participants gained a greater awareness of what other procedures are possible as well as being a tool to share good and innovative practice. Knowing how other practitioners search, fingerprint and lift fingermarks was found to be a useful approach to making tacit knowledge explicit, for others to learn from. Furthermore, any recordings generated become a portal for supervisors and mentors to view VCSI practice and offer advice to steer future examination techniques. The advice and information expressed in these tacit knowledge exchanges can also be assessed by departmental managers through a process of peer review.

#### **5.1.5 Creating a library of exemplars for forensic practitioners, mentors and supervisors to use in assessment and moderation.**

A specific recommendation from the last is that head-mounted camera recordings can be used to create a library of crime scene examinations showing examples of good practice - exemplars. These will be useful to new in-service practitioners and of equal importance is that they may serve as a moderated bench mark for assessing competency in the workplace. This is

necessary to consider since the grading of competency is arbitrary with no formal exemplars as references. With head-camera technology, police services have the opportunity to moderate performance with each other, allowing a sensible robust method for assessing and validating competency. Extending this principle, it is recommended that practitioners be given the opportunity to present evidence of their own competence over a given time frame. During this time practitioners can capture examples of practice that are aligned to standards whether these are National Occupational Standards as set out by Skills for Justice or those presented by the European Network of Forensic Science Institutes. Practitioners are therefore given more responsibility and the tools in deciding on their competence in the role. This has the potential to answer some of the impending problems with ISO 17020 which at the time of writing is far from being implemented in all Scientific Support Departments in the United Kingdom. As stated in the literature review, competency standards for Crime Scene Investigation do not cover *how* the examination process should be implemented only *what* is required to be achieved. As a consequence, this has the potential to be confusing and does not help the examiner develop their own performance or skill since they are not able to determine how this should be realised or indeed, what the standard looks like. Head-mounted camera technology provides a chance for the forensic practitioner to informally assess themselves against peer reviewed examples, to see for themselves how they should be performing. A repository of captured scenes facilitates this development and also serves as a method to validate and evidence the competence of the practitioner.

#### **5.1.6 Understand the complexity presented in the role of the Volume Crime Scene Investigator and find alternative ways to measure performance that have worth.**

It is recommended that greater attention is paid to understanding the complexity of Volume Crime Scene Investigator practice. This thesis has shown that these participants express significant levels of professional



judgment and expertise albeit *bounded* to volume crime. To develop and assess practice it is important to know where examples of this competency will be found. Knowing which physical actions and cognitive process occur together, allows for better, more informed observation and measurement. The spatial plots in this thesis explain the grouping of certain procedures and cognitive responses, appreciating that *evaluation* and *searching* are connected and related to *strategy* building is not only interesting but provides guidance for those assessing competency standards. Further research is proposed on a larger scale to test these findings as well as work to map examples from the nodes in the spatial plots to agreed standards.

The observation and interview data of the head camera study exposed many useful examples of other techniques and ways of working that were not measured by formal metrics. Measurement of practitioners needs to move beyond only collating frequencies of forensic products. Whilst this kind of measurement is necessary for police business and plays a strong role in maintaining performance it should be recognised that other useful measures of performance are needed that have an impact, not just on detecting crime but also reducing it. Furthermore, the service provided to the public during these crime scene visits needs to be formally understood, recognised and indeed measured. '*Communication*' and '*Gathering Information* nodes' also captured examiners advising the victim of crime about crime prevention or exposed why themselves or property were targeted. This information is regarded as being the corner stone of 'target hardening' and 'cocooning' in order to reduce repeat or near repeat victimisation in community policing. In addition, participants presented case histories about being caring and offering reassurance, these instances appeared to be important to the VCSI and there is strong evidence that this approach was appreciated by the victim. These play a fundamental role in reassuring the public and instilling confidence, moreover they connect with reducing the fear of crime. It is strongly recommended that these 'softer' aspects to the role be measured

using the technology discussed in this work. Performance monitoring needs to move beyond solely numerical metrics, this is critical in assessing all aspects of performance.

Stocktaking the knowledge held by practitioners is therefore seen as a worthy endeavour and useful for those that need to make decisions on recruiting and capability. This thesis has explored expertise theory and applied it to the domain of crime scene examination, it has used technology to capture and analyse performance, in order to better understand how this role is actuated. Furthermore, it has shown that there is much more to the role than that routinely collated in performance metrics. It is therefore recommended that further work be carried out to create key performance indicators that recognise and value crime prevention advice and what service is provided that reassures the public. This is important since the National Occupational Standards by Skills for Justice and European Network for Forensic Science Institutes do not comment on this part of the role despite participants in this study believing it to be fundamental.

## Conclusion

This chapter has provided a number of key recommendations supported by the experimental work presented in earlier chapters, as well as from specific expert and work performance theories. Some of these recommendations can be defined as *acknowledgements*, or acceptances from a particular standpoint. Other recommendations are more specific, pushing for research on selected topics based on their perceived worth as well as identifying possible stagnation points that have the potential to blight the domain.

The following section pulls together all the main components of this research and reflects back to the research questions, moreover it goes further and identifies new research questions that unpack and follow on from the simple four questions stated in the Introduction section.

## 6 Thesis Conclusion

This section of the thesis will specifically address the findings from the four research questions presented in the Introduction:

- Question 1. *What is the role of the Volume Crime Scene Investigator and where does it sit within UK Policing?*
- Question 2. *What metrics, competency standards and professional bodies measure or assess Volume Crime Scene Investigator work?*
- Question 3. *Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?*
- Question 4. *Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?*

**Research question 1:** *What is the role of the Volume Crime Scene Investigator and where does it sit within UK Policing?*

This research has uncovered that the role of the VCSI is more diverse and complex than initially considered and indeed portrayed in the literature. The label of volume crime is difficult to define and for the participants in the ethnographic study the scene attendance criteria strayed out of the classic volume crime definition. Simply put VCSIs can attend serious offences even where the perception is that the offence is 'volume crime'. This however is

not all bad; when examples of this occurred knowledge was exchanged between the VCSI and their more experienced peers. It could be argued that the blurred boundaries of attendance criteria, simulates development in practitioners, however frustrating this may appear in practice.

There is also no evidence that the role is firmly aligned to other similar practising examiners in other police forces within the United Kingdom. (At the time of writing the dynamic nature of this role is still fluid and far from being static for some time.) Whilst it is possible to state that in terms of its role profile, the role of the VCSI in UK policing is to attend volume crime scenes and observe and recover forensic evidence. In practice this clinical label is far from true. As section 1.1 presents, there are many titles of the forensic examiner with little commonality, even amongst bordering police forces or within individual constabularies. On an aside this in itself demonstrates the insular nature of policing communities, therefore to be firm on where the VCSI role sits within UK policing would be quite wrong. To a degree this is alleviated in some way by the fact that the majority of training of forensic practitioners occurs at two establishments, although this itself is changing as section 1.1.1 explains with examples of police forces using graduates that have studied the discipline at Higher Education Institutions to degree level.

It has been possible to state that the examination process is not centred on simply finding forensic evidence in volume crime offences. The Discussion section fleshed out the concept that *searching* has a different but deeper meaning with much more emphasis on the potential of evidence. Here examiners have an understanding of the environment and surface on which this evidence may be found. The work is organised into a series of interconnecting and interrelated physical and cognitive events, section Figure 3.31 neatly presents the grouping of these physical and cognitive nodes showing that there is much more to finding and collecting evidence. There is evidently a significant understanding about how the crime scene environment could yield evidence as well as the evidential worth of pursuing specific

courses of action. The organisation of this process has multiple micro strategies and evaluations which are connected to information obtained. This information evidently requires processing and checking. It can be said with a degree of certainty that learning how to make decisions in crime scene work is more valuable than searching for overt forensic evidence.

The culmination of this work rests on routinely produced fact based statements provided by the examiners, despite it being apparent that the presentation of these facts rests on some form of interpretation of the evidence or circumstances at the scene. Within the structure of the organisation and indeed role more widely there is a perception by some (Brown, 2009) that the examiner role has no part to play within the expert witness sphere. Indeed literature states that examiners choose to adopt a camp on whether they themselves see the role as having any interpretative element (Baber *et al.* 2006; Garrett, 2003). This should be questioned, evidence cited in court as being factual when it has been recovered as part of a decision making process leaves open the possibility that a different examination could result in different forensic evidence being recovered. Consequently perhaps Volume Crime Scene Investigators do not report factual evidence as the domain believes but actually opinion based material.

Section 3.10 *What makes a VCSI?* uncovered another side to the role of volume crime scene investigation, a side that showed empathy, sympathy, and spending time reassuring the victim or offering detailed crime prevention strategies, at no cost. At times the VCSI participants connected with the victim, with positive outcomes, for example the victim no longer felt afraid or were left empowered. This is not classically portrayed in UK policing doctrine however it was apparent in the VCSI participants' work. To measure this role's performance based on solely frequency metrics fails to capture these aspects or recognise where it sits in today's modern policing. This discovery, how they practise and the strategies they build into the examination phase, clearly has worth. There is no evidence that data is captured to ascertain if

this crime prevention advice is correlated to reducing repeat victimisation, or if the reassurance they afford reduces the *fear of crime*. This should be addressed. Police services are measured and judged on these criteria and so it makes sense to develop this in those involved in community policing such as the VCSI. Evidence from the VCSI participants clearly showed that this is something they invested in and valued as its other benefit was that it aligned with gathering information to inform the forensic examination. This was made clear through the analysis of the spatial plots.

**Research question 2:**

- *What metrics, competency standards and professional bodies measure or assess Volume Crime Scene Investigator work?*

National Occupational Standards from Skills for Justice and the European Network of Forensic Science Institutes provide standards that are used to classify what those in the occupation should be capable of. In addition to these standards is the QAA Forensic Science benchmark statement (2012). This captures aspects of Crime Scene Investigation and provides guidance to those delivering forensic science academic programmes. These cover threshold standards and typical standards in processing, recording, packaging evidence as well as an understanding of the roles within the forensic science sector. Although mention is given to ethical standards these are primarily in relation to academic ethics and the consequences when processes are not performed properly or where professional judgments are pushed too far.

These standards are used in the production of role profiles for the profession and have specific importance for practitioners early on in their career. However none of these standards are clear in how these processes should be implemented or specifically where in the crime scene examination phase they are they likely to appear. These statements state what should be done

not how, consequently there is little understanding in the domain on how Crime Scene Investigators examine volume crime scenes. This thesis has identified differences between expert and novices in their searching strategies. The eye-tracker work showed experts to home in on areas of importance. These practitioners understood what surfaces could yield forensic opportunities. This was analysed further in the head-mounted camera field study with data presented as a series of Jaccard's coefficient spatial plots, and accompanying narratives. The Volume Crime Scene Investigators needed to spend time analysing surfaces and evaluating their worth. This was reflected in the ability of the surface to afford promising opportunities or where potential evidence did exist, to what extent did it provide useful intelligence. This understanding is not communicated in the sector standards, nor is their appropriate guidelines on where in the crime scene examination that this evidence can be found in order to map to them. Expanding on this further, assistance is not currently provided on how standards in the United Kingdom can be moderated or held for storage as exemplars of a standard. Research is also thin in understanding on what exactly is performed at the crime scene by forensic scene examiners and what is regarded as important by the examiners themselves in their role. Although there is evidence of police forces using these standards during the initial probationary phase of an examiners career and for experienced examiners that have joined them from another police force, there is no evidence that these standards are used to measure performance between examiners in different forces. Furthermore there is no evidence that these standards are strongly associated with practitioner development. Literature in this area is principally filled with examiners being compared on the frequencies of their forensic product recovery and identification rates. These are also measured between police forces. This thesis explored whether this is the only way examiners should be compared and posited if alternative methods could be provided. Moreover if these alternative methods would

actually provide a clear understanding on how examiners learn, develop and perform.

**Research question 3**, *Can expertise development theories assist in providing a methodology for the construction of an observational frame work, to better understand the work of the Volume Crime Scene Investigator?*

Human factor research on the subject of expertise and expert performance has strayed over the boundary with education theory. Although still not overly discussed the references to Schön (1983) cannot be ignored, as they present an understanding of the complexity of how expert practitioners make sense of their environment.

The relationship of *practical intelligence* and *tacit knowledge* acquisition in this theory appears synonymous with *reflection* and *critical analysis*. Theory is blended further though the exploration of *proficiency* and *competency levels*, with each level being defined and evaluated.

Human factor research again dovetails with education in its methodological approach, here Cognitive Task Analysis provides robust tools from which to deploy and measure expertise, assess competency or to manage knowledge. These tools explore sociological ethnographic study as much as they advocate positivistic approaches. Observation and recording are connected with innovative perspectives to map knowledge and skill.

In essence it is through using the tools presented in these theories that allowed the work of the Volume Crime Scene Investigator to be uncovered and better understood. Early police doctrine (ACPO, 2005) identified the role as having an investigative element which needed to be recognised and championed. Although the work of ACPO, 2005 explored decision making it did not intend to capture the practices of VCSI work despite it covering the topic of decision making during police investigations. Moreover this element of the role is not measured or overtly assessed. The research in this thesis



has made explicit the theories of expertise development and how it may be used to observe crime scene examination work. The benefit of this is that it has allowed greater clarity in understanding how forensic practitioners operate. Just as in the case of nursing (Benner, 1984) and physical therapy (Jensen *et al.* 2000), through understanding what the examiner does it is possible to offer recommendations to develop the practice as a whole. Appreciating Grounded Theory tools and associated qualitative software has illuminated elements of this domain that have not been observed before. A richer understanding of the role has been achieved through this chosen methodology.

Eye-tracker technology and verbal protocol analysis in chapter 3 has shown real measurable differences between novice and expert forensic examiners. The combination of these methodologies and head-mounted camera technology allowed a perspective of the examiner not seen before.

The literature presented interesting methods to uncover domain practice, from using eye-tracking in sport, (Ward, *et al.*, 2007) to making the most of conventional interviews. Although the difference facets of observation methodology have been discussed it is worth noting that an own point of view perception recording was presented as being sensible and gave a better and less abstract view than standard straight video (Omodei, Wearing and McLennan, 1997).

What does need to be stated at this juncture is that utilising NVivo 9 in coding VCSI video data, is novel and has not been observed elsewhere in the literature for crime scene investigation. This is a step change from early frequency counts as presented in the simulated element (Baber and Butler, 2012). This is interesting as the boundary between quantitative and qualitative is no longer distinct. This is not to say that a clear goal or ontological vision is no longer needed: simply it would be wrong to purport that such visions cannot ebb and flow between positivism and constructivism

in terms of data collection at least. This is an important point to emphasise as traditional methods of observing examiners have been to judge their forensic recovery rates and subsequent forensic submissions (Adderley, Townsley and Bond, 2007). Further there is no evidence that these traditional forensic recovery and identification statistics measure the standards laid down within the sector.

NVivo 9 offered an approach to providing qualitative answers with some assurances. To use statistical tests such as Principal Component Analysis, Factor Analysis or Correspondence Analysis, would require the observer to have a clean division between tasks when recording their frequency. VCSI work is far from clean and so to obtain a fuller and more in-depth understanding it was necessary to explore the analysis of rich description and Grounded Theory qualitative tools.

The positivistic component in this study allowed the exploration of a framework, grouping behaviour to form categories from which each VCSI participant and novice could be measured against. In highly controlled settings it identified quantifiable results, many of these were statistically significant and from these results it was possible to map out strong differences between novice and expert examiners. We now know that expert practitioners target far fewer items during the search phase and that they spend much longer looking at the items they find of interest. The expert examiner group spent much time evaluating the surfaces on which forensic evidence may be found. They also spent longer making sense of the environment and how this connected with the information about the recorded simulated crime. This on its own however did not open up fully the practice of crime scene examination or why they chose to do these things, only that they were different.

Reflections by the VCSIs were initially repeats of the documentation recorded in the crime scene report form, with critical analysis as a subtext:

experimentation and tacit knowledge were presented in these reflections, justifications for actions and decisions were strongly accorded. These were reinforced in the interviews, where the sharing of knowledge and socialising into practice were also key themes. Moreover this knowledge sharing appeared to be ad hoc or even accidental. A constant in the interviews was the forensic examination laboratory as a focal point for the sharing of knowledge; a meeting place for work and the sharing of ideas and practices. This *socialising into practice* was mentioned by each participant. Knowledge of this theory allowed examples to be recognised when they occurred. Consequently when participants stated that they have changed their fingerprint habits further exploration was generated. In this example the fibreglass brush was substituted for an animal hair brush when using aluminium powder. In addition participants at times expressed a desire to learn not how to fingerprint or other micro level examination processes but instead to view approaches by others in how they examine surfaces.

Through following a human factors and sociological approach to observation, data collection and coding it allowed examples such as the ones mentioned to be elicited and captured. This is again crucial as today the socialising into practice of examiners, the acquisition of tacit knowledge or indeed the development of expertise (in this domain) has not been undertaken until now. Observation skills and a sound framework, is needed for those engaged in developing the crime scene practitioner.

The role of the VCSI has been shown to be more complex than that represented in key performance indicators. VCSIs spent time communicating crime prevention or providing reassurance to the victim, examples showed how they related to the victim and on occasion empathised. They were keen to develop and obtained knowledge and skill from mentors, peers and supervisors. There was a desire and a willingness to understand how other examiners perform, what techniques they use in order to find more fingermarks. When and where these instances occur has the potential to

develop investigator practice; the challenge is to seize these examples and provide a suitable method for practitioners to engage with this knowledge.

This leads into the final research question:

**Research question 4.** *Is there an alternative perspective to observing Volume Crime Scene Investigator work which is not currently identified or measured by existing metrics that can still offer value?*

The VCSI role has been unpacked and a methodology has been constructed to observe forensic practitioners, the construction of Table 3.11 provided the framework that allowed patterns to be found in the work of the VCSI. Moreover the verbal protocol analysis also showed that this work was diverse, more than simply observing, recording and packaging forensic material. There is a deeper more analytical perspective to this work. Surfaces are analysed in terms of their construction and ability to potentially offer forensic evidence. Examiners decide on the best brush-powder combination to develop fingerprints, this was not the same for all participants and was based on personal experience rather than being research led, certainly not in the formal sense. Each examiner had their own methods, for developing fingerprints, dealing with forensic material or approaching a crime scene. It would be wrong to identify which is best as many examiners believed it was what worked best for them. This is where additional work is needed, it is argued here that better information needs to be provided to forensic examiners on what works best. This should be coupled with easy to digest statistical significance guidance for examiners to do their own studies: to test empirically for themselves. Here forensic practitioners would have the skills to test their own findings using agreed scientific principles. Moreover it is this new area that should find its way into the foundation of sector standards. This is the gateway to the next research question and beyond the scope of this current thesis.

Pushing on through an examination even though the likelihood of recovering viable evidence was unlikely was a factor the examiners had to learn to deal with. Nevertheless maximising the opportunities they saw, was critical to their role. Through engagement with others the boundaries of what could be done were pushed further, new ways of thinking to deal with forensic evidence were made apparent. VCSIs capitalised on this and enjoyed it when supervisors viewed their work and offered suggestions on what else could be obtained from the scene. This aspect not only demonstrates what the VCSIs learnt but also has the potential to provide evidence of development. The transmission of tacit knowledge by a supervisor to a VCSI could be a key performance indicator for the supervisor: all captured for others to learn from.

These observations begin to identify what VCSIs value but are not being measured on in VCSI work or even described in sector standards. This thesis does not advocate removing existing metrics altogether, instead it highlights a reconfiguration to the fourth research question initially posed by stating what additional areas could *supplement* existing metrics.

### **6.1.1 Capturing performance**

Performance measurement should include evidence on how forensic investigators are examining the scene, the decision making process on what surfaces are being selected and whether the evaluation of these surfaces and the intelligence is correct. Strategies are based upon the analysis phase of the examination; this analysis governs and sets up all subsequent examination phases such as preparation, resource selection and submission of exhibits. Gathering evidence that these aspects are correct should be a part of performance management.

Crime prevention advice by VCSIs to reduce repeat and near repeat victimisation needs to be viewed as being of equal importance to the collection of forensic samples. VCSIs highlighted this with victims of crime,

often in a gentle but telling manner, for example the importance of having a parcel shelf in a car to remove from view items in the boot, or the importance of a properly fitting side gate and a weather proof lock.

### **6.1.2 Meeting the requirement of the gate keeper: Participating North East of England police force.**

These examples provided evidence of having met the participating police force's objectives as identified in the Methodology section and section 2.2 *Links with other force projects and programmes* of the Project Initiation Document (Appendix C). Addressing the three points of the Human Resource People Strategy 2009, the research results and analysis showed that head-mounted camera technology could be used to retain and promote a committed and skilled workforce. Moreover it capitalised on point two by allowing staff to contribute to their own development and operational effectiveness. The video recordings gave them the ability to revisit their crime scene examinations which allowed for deeper, more insightful reflections. This was facilitated when a more advanced peer or supervisor assisted by reviewing their recordings with them and offering advice to capitalise on additional forensic opportunities. Reflection examples were evidenced more so in the interviews than in the reflection diaries, nevertheless all of the examples provide an evidence based approach to both the participating police forces' Human Resource strategy for people in the work force, Joint Policing Plan and research questions set out at the beginning of this thesis. One VCSI reflected that she repeated the same phrase over and over to victims of crime, before recording her examination actions she was totally unaware of this behaviour. Another learnt how other practitioners used very different powder and applicator combinations for finding fingerprints. Speaking aloud for participant 2 enabled her to package up her exhibit descriptions into an easy digestible form before writing up her crime scene

report. Previously she struggled to easily construct descriptive exhibit reference terminologies.

These are just some of the evidence based examples; Chapter 4 provides further and more in-depth instances. This evidence extended further into point two by providing examples of skills and ways of working that identified good work and also where development was needed. Point 2 also comments on accreditation; the PID is general in this term when it was first written nevertheless in a more modern setting this could come to serve some of the issues in evidencing good practice for ISO 17020 accreditation.

The ethics and ethos behind the managerial support of the head-mounted camera achieved point three of the Human Resource (HR) People Strategy (2009). Here technology was used to create a healthy and supportive working environment; an environment where practitioners were encouraged to share their recordings in order to foster learning, rather than working alone, in isolation and fearful of inspection. Inspection was welcomed by the participants and where the supervisor could not review work quickly enough, this was met with disappointment.

The Joint Policing Plan 2009-2012 had four objectives: the first objective is similar for the HR people Strategy as it discussed, empowerment, personal development and a responsive flexible workforce. However more than this it also discusses innovation; this is where the head-mounted camera project and to a degree eye-tracking experiment (as this participating police force also provided participants for this work as well) is a novel flexible innovative method to capture forensic practitioner performance. At one level it can be watched, reflected upon, at another level it can be analysed and coded to inform and uncover practitioner practice that is not overtly seen or understood. This dovetails into the Join Policing Plan's second and third point in that it exploits opportunities in using technology in the Criminal Justice system as well as "improve performance in acquisitive and volume crime".

This project does not explore if the implementation of the head-mounted camera improved metrics, this is an opportunity for future work, nevertheless there is evidence that participants learnt new methods and thought differently and positively about their work. In terms of the fourth and final point its cost, was extra time in using the technology, a point that Chapter 4 states should not be ignored however its monetary value was less than £750 for both head-mounted camera sets, including digital video recorders, remote control units, memory cards, DVD burning facilities and Net Book computer. This is a small cost for the value that this technology provided. Equipment cost of the project, specific travel arrangements and transcription services came to just under £3000.

### 6.1.3 Future vision

The challenge is to collate examples of examiner practice; the recommendations sections stated that investigator practice could be captured using head-mounted camera technology. The field experiment showed this technology to be robust with clarity being more than sufficient for detailed examination even after file compression and reformatting. The benefit of this technology is the storage and ease in moderating and demonstrating competency standards or specific performance criteria. This sets in place further research questions:

- Further work needs to be done in understanding, what additional aspects of the forensic examiners role are perceived to have worth other than those recorded?
- What variation is there in the examination processes between Crime Scene Investigators and which of these (if any) are evidence based?
- This thesis has demonstrated that head-mounted camera technology can be beneficial in showing tacit knowledge, and *reflection* to be connected with developing innovation: To what extent would this be seen in large numbers in the profession?



- Is there a correlation with those that have enhanced abilities in these 'softer skills' and the conventional metrics currently used to measure performance?

The above four questions should set in motion the next stage in understanding and developing the crime scene practitioner, they have been constructed to test the results obtained thus far as well as cutting new ground in this fertile area of police and forensic research.

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## Appendix A: Eye-tracker research day e-mail briefing to participants



SPECIALIST STAFF  
SUPERB FACILITIES  
SUCCESSFUL PARTNERSHIPS

**Crime, Forensic and Policing**

### **Research Eye-Tracker Project in partnership with Birmingham University**

#### **What is this project about?**

The purpose of this research is to ascertain whether there are any differences in how different examiners see and make sense of the crime scene environment.

#### **What will I have to do?**

You will be asked to look for forensic evidence and to write it down. You will also be asked what you believe the chances of the crime being detected based on the evidence you have seen. We ask that you are as natural as possible in this simulated role. The principal aim is to learn from everyone taking part to hopefully better understand crime scene examinations and improve teaching and learning in this field of study; this is in no way a test or assessment.

You will be asked to wear what is essentially a device similar to spectacles that records where you are looking in the scene, this is interesting as we wish to understand how evidence is searched for. You will also be asked to speak out loud which will hopefully allow us to gather a little more data on what sense you make of the environment. There are only 2 separate scenes to examine with each scene comprising of one room. You will only be asked to examine each scene for a maximum of 15 minutes, there will be no need to package any exhibits or to complete a scenes of crime form in full. We ask that you bring with you a few scenes of crime forms to fill in the exhibit list, providing exhibit numbers and descriptions.

#### **Who else will be there?**

In total there will be 6 crime scene investigators/scenes of crime officers taking part and it will be an opportunity to meet up with people doing the same role in another county only a few miles away. Students will be arriving later as the scene house is not sufficiently large enough to accommodate everyone together. Professor Baber from Birmingham University will be in attendance to ensure the eye-tracker functions accordingly. Professor Baber has published significantly in the last 20 years and in recent times has researched crime scene examination, concentrating on where wearable technology can assist the crime scene practitioner.

#### **How long will it take?**

You are asked to arrive for 10:15, your total time examining scenes will be half an hour. We will also take the opportunity to ask about your experiences and what you believe teaching and learning should focus on. You do not need to prepare anything beforehand, and lunch will be provided at 12:00 after which you can either stay, have a look at our teaching facilities or make your way back to your force area. Toilets are onsite in the facility.

#### **Where are you and where do I go when I arrive in Middlesbrough?**

A space has been made available to you in the Cornell Car Park, Woodlands Road See the link for how to get here.

<http://www.tees.ac.uk/sections/about/Travel.cfm>

Please meet in the main reception at 10:15 in the Middlesbrough Tower. don't

**VCSI  
Research  
Operations  
Handbook**

January

**2010**

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This handbook provides guidance and instructional material for Volume Crime Scene Investigators based at (name of police station in the North East of England) engaged in developing and exploring expertise in the volume crime scene investigation research project. This is a joint research project with (name of Police Force) and Teesside University, the purpose is to explore how new in service VCSIs develop their expertise and what mechanisms assist them in their learning and operational effectiveness. This handbook covers the main aims of the project along with researcher contact details, the use of the head camera equipment, reflection diaries, interviews and data analysis.

# Volume Crime Scene Investigator Research Operations Manual and Protocol Handbook

## Researcher Contact Details

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## Research Overview

There has been much written with regard to crime scene investigation techniques and performance however little mention is made in relation to how crime scene personnel develop their expertise after initial training. As an advanced learner you already join the department with specific skills in crime scene examination and now at this stage in your career require practical onsite experience. You should already have been allocated a mentor who will provide further training and assist you in your learning through feedback and guidance. In order to obtain the necessary material on how you develop you will be asked to complete a reflection diary, take part in interviews and where appropriate wear a head camera whilst you are examining scenes. More information will be provided with respect to these later in this document. This type of research on VCSIs and CSIs has never been examined before. What I should stress at this early juncture is that this is an informal process and so it is important you feel safe and at ease with the research project. I should also make clear that this project will not be a method whereby supervisors will gather evidence in

order to be overly critical. This is important and was built into the ethics document prior to this project being granted ethical approval. Instead the project should allow you personally and with your mentor and peers to explore areas that may have been hidden without the use of head camera technology, reflections and careful interviewing. Moreover I hope it will be fun, indeed students that have had the opportunity to view their scene examinations and take part in reflection have enjoyed the process once after initial anxieties were alleviated.

The head camera is a research tool to capture performance to be viewed primarily by yourselves and also those involved in your development. It is not a piece of equipment that has been designed or engineered to be a permanent resource. In the current economic climate all public funding needs to adhere to 'best value', that simply means you need to be trained to the highest possible standards for your role profile but be ready for operational deployment as soon as possible in order to have an impact on volume crime and the community in which you serve.

As the researcher I will interview you all and explore your decision making processes, procedures and general experiences. This is in order to identify mechanisms to assist you and for you to provide me with material to allow me to construct a model that shows how advanced learners develop in the workplace.

Remember the point of the research is to see how you develop and for me the researcher to learn from this development and improve future education and competency programmes. This can only happen if you engage: your time and effort is hugely appreciated.

Your cooperation is absolutely crucial to the success of this project, a lot of time and effort has been spent by Chief Inspector (name) and Det Sgt (name) to insure you are prepared for your new role and that you progress and develop in a safe supportive environment. This project has authorisation from the

highest level in your force and has been carefully thought out over the previous months to ensure it is implemented at a time when you are still early in your career development but nevertheless secure in your work environment.

## **Reflection Diary**

You will be given a reflection diary to be completed for the 6 month project; this is a very important component for the research and also for your own development. This diary is separate from your pocket book and will record your own personal thoughts, opinions and perceptions in relation to your work and the working environment.

There is no need to complete the diary for *every* scene however challenging scenes or scenes that unexpectedly yielded forensic evidence or intelligence should be recorded. There should also be a substantial amount of general scene reflections. Noting the date and time for these incidences will also be useful for the research and your mentor. It is also important to consider aspects of note that are simply related to your practice, it may involve reflections on discussions with colleagues or incidents outside the crime scene environment. The following bullet points provide a guide as to what a true reflection considers of and is by no means an exhaustive list!

- Descriptive account of the incident or experience.
- Initial thoughts about the incident, your interpretation or opinion.
- Aspects of your work that were challenging, in essence areas that warrant additional work or attention where you believe or others believe require development.
- Focussing on the above aspect(s) examine why it is necessary to improve this area of practice in particular.

- Think through your own method on how to improve or indeed the comments from colleagues.
- What impact do you think these changes will make to your practice or to the role you perform?

You may feel that a diary note book is not the best method for you to capture these thoughts or reflections, if you wish you may use any electronic media either at home or at work, this includes the Netbook provided. You may prefer to setup privacy setting so only you and your mentor are able to have access to this material.

This is not a formal document, it can be in short hand text speak however you wish to record your reflections, the important element to keep in mind is that they are your reflections and require thought and time spent on them. During the number of scheduled interviews I will help you think about your practice and learn how you develop and where education and training can be improved.

## **Head Camera and Digital Video Recorder (DVR) Operations Overview**

The head camera has been selected to provide data on what the operator sees and says. It has software that provides a digital water mark, this means the time and date and frame selection is stamped should it be required for use in court. Other police service departments use this same technology to capture scene images from surveillance and overt operational patrolling.

The bullet camera has a good field of view and has an automatic iris. This means that as the camera approaches bright light it automatically reduces in size to produce a properly exposed video image.

The majority of the analysis will come from the recorded spoken words. It is for this reason that a microphone is part of the recording equipment which can be pinned onto webbing straps or clothing.

The Digital Video Recording (DVR) device has the facility to insert Secure Digital High Capacity Cards (SDHC), it is this media that will be used for the capture of digital images. This will allow users to take out the SD card and place it into a card reader and copy the video straight onto CD or DVD. Recording can use existing equipment within the place of work or the Netbook and CD/DVD recorder provided.

The head camera and DVR can also be used to view the recorded images using the viewing screen, the controls on this device also allows scenes to be fast-forwarded and rewind at a number of different speeds. Software on the Netbook will also allow this as well as the option to take a number of stills from the video. Any stills will be automatically deposited in the 'my pictures' folder. It will probably be best to simply view the scenes using Windows Media. A special codec pack has been installed to ensure you are able to view the files as earlier versions of Windows Media is unable to view avi or DivX file extensions.

There are two types of DVR available for you to use and both utilise the same head camera technology. It is worth mentioning that whilst the DVR and head camera are robust items of equipment they still require safe and proper use to ensure they remain functional. I will provide training on their use before you begin using them.

## **Screen Shots**

If you click on the hyperlinks below (or for hard copy appendix A&B) you will see a series of shot instructions that will assist you in finding more information about the digital video recorders you are going to use. The instructions are very informative but more importantly very easy to follow and designed for the 1<sup>st</sup> time user in mind. What is also useful about these PDF instructions is their

ability to go straight to the page that displays the information you want (via the contents page). This facility is found in the left hand column of the PDF document; page numbers are displayed in number format from 1-41 for the PV500 DVR and 1-46 for the PV800 DVR. It should be stressed that after the training session you may never need these screen shots however nevertheless they have been included should you wish to refresh yourself on any key area.

[\*\*\*Digital Video Recorder Screen shot Instructions for the PV 500.\*\*\*](#)

[\*\*\*Digital Video Recorder Screen Shot Instruction for the PV 800.\*\*\*](#)

## **Netbook**

A Netbook has been provided for police training use only, its primary function is to allow the user to play back their video captured crime scene examinations taken using the head-mounted camera.

You may also use it to copy the captured video from the SDHC card slot onto CD or DVD using the external CD/DVD reader and writer. The SDHC card slot can be found just underneath the tracker pad adjacent to the on/off slide switch. A card reader is also available should you prefer to simply connect to one of the USB drives.

If you decide not to use the diary book provided for your reflections then you may setup a folder and write them using Word which will be found in the Microsoft Office suite.



If you require the need to write statements for your work you may use this Netbook for that purpose, any contents relating to operational police matters will be deleted after the 6month research period.

The Netbook does have wifi connection and if wifi is available for you to use you may use it to search for material that is related to your work, for example free journals, books, government web sites such as Home Office Scientific Development Branch etc. You should record the date and time that you accessed the Internet and a brief synopsis and web address of what you were reading. It should be pointed out that a routine digital inspection will be carried out on the Netbook after the research period and a report kept with the research document.

The Netbook has Windows Media Player for you to watch your video images as well as standard Microsoft Office. These are also available for you to use in your capacity as a Volume Crime Scene Investigator.

The screen simply has a pull out mechanism with the 'on' switch being a slide bar on the edge of the machine to the right of the tracker pad. To turn the computer off is the same as other systems and is via the START button followed by the 'shutdown option'.

## **Interviews**

A significant part of this research will be via interviews. These interviews will be informal conversations. An initial interview will be focus group based and is designed to illicit your experience and knowledge. What is critical is that you are open honest and free in the responses you give; I again need to stress that this project has not been constructed to identify bad practice but instead for researchers to learn how VCSIs develop their expertise. There are times when individuals identify shortcuts to new, better or more efficient methods of working, these will not be treated as deviations away from good or best

practice but instead examined and analysed for future practitioners. At the beginning the interview topics will be wide ranging and gradually become more focussed. It is anticipated that interviews will be recorded allowing for transcription and coding. At no point will individual names be mentioned in any published material. This is necessary to mention and was a key feature in obtaining ethical approval. The interviews will not last long and during the 6 month research project will only be repeated a few times. The interviews will be semi-structured and many of the questions will be routine revolving around working practices such as job allocation, type of crime attended, shift patterns, mentor and peer assistance. This will allow a framework to be created of what you do and how you carry it out.

## **Data Analysis**

Even a small amount of data can take many hours to analyse. This analysis will be using elements of grounded theory qualitative tools. Firstly the interviews will be transcribed and coded, these codes will be grouped together to form themes, these themes will then be compared.

The head camera data will be rich and like the interviews the verbal commentary will be transcribed and analysed. This analysis will examine working practices and cognition: thought processes in knowing what to do and when, as well as any operational decisions. The video data generated will be examined by decomposing these practices into actions that make up a task. These tasks will be listed along with the decisions that are associated with them. It is intended this will build up a picture of how VCSIs learn and develop and where information that is deemed most valuable is accessed.

The type of scenes will be varied and may include examination of property, vehicle crime and burglary other than dwelling etc.

Experimental science will normally have a hypothesis stated at the beginning or clearly defined research question that asks to be tested, for example “which fingerprint brush Zephur or Skye performs better at enhancing latent fingermarks on a smooth non porous surface?” This could be rephrased and analysed with a one tail quantitative statistical test with its corresponding null hypothesis:

H1 “Zephur brushes perform better than Skye brushes when enhancing fingermarks on a smooth non porous surface”

Ho “Zephur brushes do not perform better than Skye brushes when enhancing fingermarks on a smooth non porous surface”.

An experiment could then be designed to find out which brush performed ‘statistically’ better.

Research questions phrased ‘how’ often lend themselves to be explored using qualitative methods and no real test of which is better exists because the purpose is to explore how something is created, generated or learned. The project involving you as a Volume Crime Scene Investigator will be addressing **how** VCSIs develop their expertise. There is no test which will identify which one is the best, if this was the case the project would have been designed very differently! It is therefore important to understand that this project should not place any undue pressure on you at this early stage in your career and development. This project is designed to assist you in your working practice as well as to identify new and innovative ways to improve teaching and learning for students, operational VCSIs and CSIs.

You will also get the opportunity to read through any analysed data to see whether my interpretation is correct, since we all construct meanings and interpret findings differently through these constructions. To ensure the data is trustworthy I will ask you to examine my interpretations, you therefore will have the opportunity to review and correct any misinterpretations. This is a very

important part of the project and your authority in this review process to implement any corrections is absolute.

Thank you again for taking part, your time, thoughts, actions and effort in this project is very much appreciated.

**Appendix C: Head-mounted camera Police Project Initiation Document**

**PROJECT INITIATION DOCUMENT**

(name of Local Policing Unit)

Release: Draft v 0.1  
Date: 17<sup>th</sup> November 2009

**Development of Training Methods for  
VCSI**

Author: Sgt Alan Cairns

## Work Package History

### Revision History

Version	Date	Description of Changes	Approved by
0.1	17/11/09	Initial draft document	940

### Approvals

This document requires the following approvals:

Name and title	Signature	Date	Version

### Distribution

This document has been distributed to:

Name and title	Department/Organisation	Date of Issue	Version

# **Table of Contents**

## **1.0 Purpose of Document**

## **2.0 Context**

### **2.1 Background**

### **2.2 Links with other force projects and programmes**

## **3.0 Project aims and objectives**

### **3.1 Project aims and benefits**

### **3.2 Project objectives**

### **3.3 Project scope**

## **4.0 Project approach**

### **4.1 Project plan**

### **4.2 Key project tasks and milestones**

### **4.3 Project resources and their impact on other areas of business**

### **4.4 Project funding**

## **5.0 Project organisational structure**

### **5.1 Key project roles**

## **6.0 Controls**

### **6.1 Frequency of key meetings**

### **6.2 Reporting and escalation mechanisms**

### **6.3 Tolerance**

### **6.4 Change control**

### **6.5 Project risk management**

## **7.0 Communications strategy**

### **1.0 Purpose of Document**

The purpose of this document is to outline a project to address the development needs of Volume Crime Scene Investigators (VCSI), namely to map expertise development for approximately six months, and to examine the effects of VCSIs using head camera technology as a training resource to aid reflective learning, assessing the use of this technology as a development aid.

### **2.0 Objectives and Scope**

#### **2.1 Background**

Volume Crime Scene Investigators (VCSIs) were introduced into (name of North East Police Force) workforce in August 2008, and are currently based at (name of Police Station) Area Command, attached to the Workforce Modernisation Demonstration project site.

The four VCSIs appointed in 2008 have since left their roles to become Scientific Support Officers, and 3 new VCSIs have now been appointed and are in post.

The fourth position remains vacant pending the appointment of a candidate to this post on completion of vetting (which is currently underway).

The newly appointed VCSIs have undergone their induction and are now in post.

VCSIs attend scenes of volume crime, e.g. theft of motor vehicle, burglary, criminal damage, complete crime reports and conduct relevant enquiries, e.g. house to house, CCTV recovery and simple statement taking.

#### **2.2 Links with other force projects and programmes**

This Project links to 3 of the 5 objectives for the **Human Resources People Strategy 2009**:

- Resourcing and career progression – we will retain and promote a skilled and committed workforce.
- Learning and development – we will motivate and maximise the potential of all staff to enable them to positively contribute towards



operational performance by having effective processes in place to accurately identify skills, training and learning needs, and accessing the appropriate products, services and approaches that meet those needs, including the use of accreditation.

- Managing and maximising people performance – we will effectively manage and maximise the performance of our staff by ensuring that we provide a healthy and supportive working environment.

By using the head camera technology for expertise development, the project also links into two of the strategic aims and also the objectives of the **Joint Policing Plan 2009-2012**:

- People - creating a culture which promotes empowerment, innovation and personal development to ensure we maintain a diverse, responsive and flexible workforce.
- Innovation and technology - ensuring that the force can exploit opportunities in science and technology and perform as part of a modern and respected Criminal Justice System
- Improve performance in acquisitive and volume crime
- Make best use of resources to operational performance whilst delivering the Value for Money Strategy.

### **3.0 Project aims and objectives**

#### **3.1 Project aims and benefits**

This project aims to test the use of technology to assist reflective learning.

The benefit to the organisation is that the method will be assessed for future use in other areas of business and possible expansion to other applications for learning and development, as well as for consideration of continued use within the sphere of crime scene examination.

It is anticipated that the development of the VCSIs subject of this project will be enhanced, resulting in better performance in the workplace.

This will result in more efficient performance in crime scene investigation, with the follow on benefit of increased recovery of forensic evidence leading to the potential for improved detection rates.

This project will enable delivery of the organisation's commitment to staff development and the use of science and technology.

The project promotes enhanced links to external organisations, enhancing the standing of (name of north east police force) through working in partnership with Teesside University to develop new methods to develop staff.

### **3.2 Project objectives**

The principle objective of this Project is to test the use of recording technology as a method to be used for reflective learning.

The project will also deliver enhanced development within the role of VCSI in (name of Police Force), by improving their training and learning methodology.

The aims of the project will be delivered through the use of head camera technology to record crime scene examination by VCSIs at (Local Policing Unit).

The technology will allow audio as well as video recording, so that the VCSIs can give a commentary to explain their approach and methodology to crime scene examination.

A diverse variety of crime scenes will be selected to allow variation of approach.

The recording will then be used as the basis for reflective learning processes, and will be debriefed with an identified SSO mentor.

Development over the course of the project will be assessed internally and independently verified by Senior User Mark Butler.

This benefit is not quantifiable with ease, and assessment will take place by way of both assessment of performance improvement from the pre-project baseline to performance at the end of the project; and also from user feedback from the VCSIs in consultation with objective assessment reports by the SSO mentor and Senior User Mark Butler.

### **3.3 Project scope**

This document outlines the plan for the implementation of this project, outlining project phases and sets target dates for the implementation achievement.

The project involves the learning and development of the VCSIs at (name of local policing unit) area command as a specific and defined group.

There are 4 VCSI posts within this group (3 of these positions are currently filled, with the fourth position being vacant pending completion of vetting procedures for one applicant).

An allocated mentor from Scientific Support Department will be nominated. No other VCSI or Scientific Support Staff will be directly involved in this project.

The project team (Project Manager and Team Manager) will be supplied by (Local Policing Unit). No other staff from (Local Policing Unit) North sector will be directly involved in this project.

This project is anticipated to last between 3 and 6 months, depending upon the outcome of interim review meetings and progress reports.

## **4.0 Project approach**

### **4.1 Project plan**

A project plan will sit alongside this document with details of project phases, tasks, deliverables and milestones.

The project plan will be managed and controlled through the use of project management software.

The project plan is a live document which will be subject to change and review as the project develops.

### **4.2 Key project tasks and milestones**

#### **Phase 1 – project initiation.**

The project initiation phase will be completed with the submission of this PID to Senior User Chief Inspector \*\*\*\* Walker.

The PID will be used to brief all Senior Users and the Project Board, and if endorsed authority will be given to proceed to the implementation phase.

#### **Phase 2 – Implementation.**

The implementation phase will consist of allocation of work packages to prepare for execution of the project.

This project is relatively limited in scope and there are few complications, therefore it is anticipated that the implementation phase will take no more than 1 week to arrange equipment, brief staff (VCSIs and SSO mentor) on their roles and responsibilities and devise a set procedure for the recording, retention and evaluation (reflective learning period) of material from crime scenes.

The baseline will be established during this phase, which will include research of performance of VCSIs in post from August 2008 to November 2009, as well as feedback from those VCSIs regarding development opportunities over that period.

#### **Checkpoint – post implementation.**

A checkpoint report will be generated at the end of the implementation phase by the Project Manager to report progress to the Board via Senior User Ch/Insp Walker.

#### **Phase 3 – execution of the project and review periods.**

Weekly meetings will take place between the Team Manager, SSO mentor and the VCSIs to monitor progress, ensure compliance with the project, and raise any issues or identify risks encountered. Progress reports will be sent to the Project Manager.

Review meetings will take place at monthly intervals for the first 3 months. The Team Manager, Project Manager and Senior User Mark Butler will attend the monthly review meetings.

Adherence with the methodology of the project and number of scenes recorded will be monitored to ensure the target is being met.

Progress will be assessed against the overall objectives of the project. Interim assessments will be conducted at each meeting and any issues will be reported to the Project Board via highlight reports following each monthly review.

#### **Phase 4 – end project stage.**

An end project report will be generated by the Project Manager and presented to the Project Board via Ch/Insp Walker. This report will include assessment of the project as a whole and review of how the project met the objectives set out in the PID.

### **4.3 Project resources and their impact on other areas of business**

Project resources will comprise of the Project Manager; Team Manager; an identified mentor from Scientific Support department; and 4 x VCSIs.

#### Project Manager.

The work of the Project Manager is labour intensive for the project initiation phase, however following that phase the monitoring of the project is envisaged to have little impact upon the Project Manager's working time and the impact upon other areas of business is considered manageable alongside the project managers core role and duties.

There will be an impact at times of project review (monthly) and at the exit and final review stages, however this is also considered manageable alongside existing duties.

#### SSO Mentor.

There will be an impact upon the other areas of business for the SSO mentor.

The SSO mentor will be required to allocate time within the working week to debrief a scene examination with each of the VCSIs.

There will be a set format and method of recording for the scene debriefs, and it is anticipated that this will not be a lengthy period of abstraction for the mentor.

#### Team Manager.

There will be an impact upon the other areas of business for the Team Manager.

The Team Manager will be responsible for monitoring weekly progress and managing the collation of material generated during the project.

This is not anticipated to have a major impact upon the Team Manager's normal area of business as a team leader on one of the investigation teams at (Local Policing Unit) area command.

#### VCSIs.

There will impact upon the work of the 4 x VCSIs (3 currently in post) as it will have an implication on their workload, adding additional tasks at a scene and it will have a requirement to devote time to process each scene recording and conduct effective debrief, reflection and assessment.

However this it minimised in that only a limited number of scenes will be subject of recording and review per week, and this is considered a manageable expenditure of resource time.

It is envisaged that 25 to 30 scenes per VCSI in total will be required for effective analysis and opportunity to demonstrate any benefit from this technique and any progress.

It is anticipated that this will involve only one scene per week requiring any action. This is considered to be manageable within the VCSI working week and the resulting impact is considered minor.

#### **4.4 Project funding**

The project does not require any financial funding from (name of Police Force).

There is no requirement for any budget allocation as the cost to (name of north east) is one of resource time taken from the project manager, team manager, VCSIs and SSO mentor.

There is a requirement for (name of north east police force) to store equipment supplied securely and to protect this from harm.

The physical equipment will be supplied by Teesside University.

### **5.0 Project organisational structure**

#### **5.1 Key project roles**

Senior Executive: Assistant Chief Officer \*\*\*\* Bernie McCardle, Director of Human Resources. HR Dept.

- Will have ultimate responsibility for the project and business assurance.
- Responsible for chairing any project board meetings required.
- Responsibly for any key decisions required at project board level.

Senior Supplier: Chief Inspector \*\*\*\* Fred Elrick, Scientific Support Dept. Crime Dept.

- Responsible for supplying resources from Scientific Support Dept to act as mentors to the VCSIs, and providing time within the normal business of the nominated mentor to allow their project task to be completed.

Senior User: Chief Superintendent \*\*\*\* Dave Prior, Area Commander, (name of Local Policing Unit) Area Command.

- Responsible for user assurance.
- Responsible for providing user staff resources.

Senior User: Chief Inspector \*\*\*\* Brian Walker, Corporate Development Dept.

- Responsible for overseeing business assurance.
- Responsible for briefing user management on all matters concerning the project.

Senior User: Inspector \*\*\*\* Lisa Musgrove, Sector Manager, (name of Local Policing Unit) North.

- Responsible for supplying resources from (name of Local Policing Uni) North area command to act as Project Manager and Team Manager, providing time within the normal business of the sector to allow their project task to be completed.
- Responsible for supplying the VCSIs to take part in the project, providing time to allow their participation in the project.

Senior User: Mark Butler, Senior Lecturer Crime Scene Science, Teesside University.

- Responsible for supplying technical equipment for the recording of crime scene examinations and instruction on its use.
- Responsible for providing expert advice and guidance on the underlying principles of reflective learning from the viewpoint of an expert academic perspective.
- Responsible for providing a framework within which to conduct assessments of crime scene examinations, and an assessment framework with which to assess the success of the project.
- Data from this project will be used by Mr Butler for further academic research on the benefit of using technology in the reflective learning process for crime scene investigators.

Project Manager: D/Sgt \*\*\* Alan Cairns, (Local Policing Unit) North Area Command.

- Responsible for planning of the project and delivery of performance.
- Responsible for the allocation of work packages, monitoring of progress and receipt of completed work.
- Responsible for project assurance; that returned work packages are of sufficient quality and are fit for purpose.
- Responsible for maintenance of risk and issue logs, and the highlighting of any warnings of deviation from the project brief, referring any matters to the project board for a decision if required.
- Responsible for reporting progress to the project board.

Team Manager: DC \*\*\*\* Graeme Ward, (local policing unit) North Area Command.

- Responsible for assisting the project manager in the development of stage plans.
- Responsible for monitoring of progress of work packages, and to report progress to the project manager.
- Responsible for quality assurance of work packages.
- Responsible for referring any issues of concern of quality control or risk to the project manager.
- Responsible for coordinating the project activities of the VCSIs and SSO mentor once the project is initiated.

## **6.0 Controls**

### **6.1 Frequency of key meetings**

Weekly meetings are to take place between the Team Manager, SSO mentor and VCSIs.

A report of this meeting is to be sent to the Project Manager.

Monthly meetings are to take place between Team Manager, Project Manager and Senior User Mark Bulter.

A highlight report of this meeting is to be sent to Senior User Ch/Insp Walker.

### **6.2 Reporting and escalation mechanisms**

Highlight reports will be generated following each monthly review meeting. These will include any issues arising and chart progress of the project.

Any issues raised at either the weekly or monthly meetings which impact upon the success of the project will be raised by the Project Manager as an exception report and forwarded to Senior User Ch/Insp Walker.

### **6.3 Tolerances**

In order to achieve the required amount of data to enable effective assessment, between 25-30 scenes per VCSI will be required over the 6 month period of the project.

This equates to approximately 5 scenes per month per VCSI.

Due to shift requirements, deviation in the weekly return will be expected, however returns of data will be monitored to ensure that intermittent deviation does not allow the monthly return of data to fall below 5 scenes per month per VCSI.



Minor deviation will be reported by the team manager to the project manager and some tolerance will be manageable, however excessive deviation (more than 1 scene under target per VCSI) will be raised by way of an entry on the issue log and reported to the project board via Senior User Ch/Insp Walker.

Similarly, an excessive amount of data from any one period may not enable effective learning nor allow sufficient time for the learning to be effective. It will also reduce the opportunity to assess development over a protracted time frame and diminish the value of this assessment. The amount of data will therefore be controlled by the team manager to ensure that the monthly targets are being met and not exceeded. Any excessive scene data will be retained; however will not be considered to be supplied in lieu of data for later months (the 5 scene minimum per month will continue regardless of how much data was previously provided).

This will control any deviation from the planned time frame for the project.

#### **6.4 Change control**

Change will be accommodated by way of submission of a project issue, to be recorded in the issue log and reported to the Project Board by the Project Manager.

Any project issues will be reported by the Project Manager to Ch/Insp Walker following each monthly meeting.

Individual project issues will be assessed by the Project Manager and any urgent issues will be reported directly to Senior User Ch/Insp Walker by way of an exception report.

#### **6.5 Project risk management**

A risk log has been generated to be read alongside this document. See appendix A.

### **7.0 Communications strategy**

Communication will take place by way of the weekly and monthly meetings outlined above.

This will enable liaison between Scientific Support Department, the Investigation Department at (name of Police station), and Teesside University.

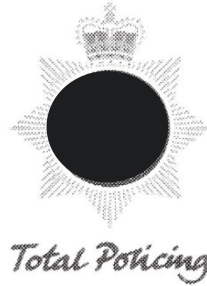
Communication between the Project Team and the Project Board will occur by way of highlight reports submitted by the Project Manager to Senior User Ch/Insp Walker.

Due to the nature of the project, there is no requirement for further internal communication within the organisation or further external communication. It is not anticipated that this project will impact upon any other area of internal or external business.



## Appendix E: Example of consent form provided to the aggrieved party

[Redacted]



[Redacted]

### Disclaimer Notice

I / We the undersigned agree that the content of recordings made as part of the investigations featuring me/us and my/our property in a clear unpixelated format, remain the property of [Redacted] Police and can be used and shown for training purposes and shared with external third parties (including Teesside University) for research and study purposes only.

Name: [Redacted] .....

Address: [Redacted]

Signature: [Redacted] .....

## Appendix F: Published outputs from thesis.

### Output paper:

Baber, C. and Butler, M. (2012) 'Expertise in Crime Scene Examination: Comparing Search Strategies of Expert and Novice Crime Scene Examiners in Simulated Crime Scenes ', *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 54(3), pp. 413-424.

# Human Factors: The Journal of the Human Factors and Ergonomics Society

<http://hfs.sagepub.com/>

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### Expertise in Crime Scene Examination : Comparing Search Strategies of Expert and Novice Crime Scene Examiners in Simulated Crime Scenes

Chris Baber and Mark Butler  
*Human Factors: The Journal of the Human Factors and Ergonomics Society* 2012 54: 413 originally published online 28 March 2012  
DOI: 10.1177/0018720812440577

The online version of this article can be found at:  
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**Output book chapter:**

Butler, M., Thompson, T. and Bel, E. (2013) 'Chapter 17: Exploring the implementation of head mounted camera technology in Volume Crime Scene Investigation', in Das, D.K., Das, M. and Melchor, C. (eds.) *The Evolution of Policing: Worldwide Innovations and Insights*. CRC Press

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**Exploring the  
Implementation  
of Head-Mounted  
Camera Technology  
in Volume Crime  
Scene Investigation**

**17**

MARK BUTLER, TIM THOMPSON, AND ÉRIC BEL

AQ1

**Contents**

Introduction	281
Literature Review	283
Method	284
Participants	284
Training	285
Equipment	286
Calibration	286
Data Collation and Processing	286
Results	287
Comments from VCSIs in Relation to Wearing the Head-Mounted Camera	288
Discussion	293
Conclusion	294
References	295

**Introduction**

This chapter sets out the use of head camera technology in operational Volume Crime Scene Investigation. It covers the design and background work needed to ensure that the requirements of this method complied with the participating UK Police Service's policy and procedures on photographic evidence capture. These procedures are regarded as being generic for all law enforcement departments. The head camera's effectiveness in capturing practice coupled with assisting the development of that practice is also discussed. Two research questions unfold from this concept: (1) How can technology

281

**Appendix G: DVD containing VCSI Crime Scene Videos, Verbal Protocol Transcriptions, Consent forms (where appropriate) and Tech 5 Scenes of Crime notes, NVivo 9 software program file and transcription of interviews. (HELD SEPARATELY TO THE THIS THESIS)**