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Psychological Profiling and Computer Forensics: Locard's Principle in the Digital World

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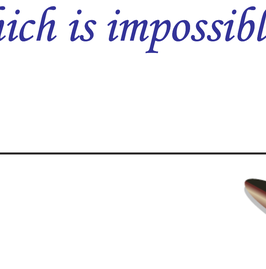
Abstract

The current project examines the need to extend psychological crime scene analysis from its current supportive role in physical crime scene analysis, to an identical role in digital and cyber crime scenes. The fundamentals of crime scene analysis are discussed and a focus on the ability of psychological cyber crime scene analysis to answer the FBI's critical elements is presented. A model illustrating the analogous physical and cyber crime scene elements is provided. The importance of cyber victimology in profiling and target hardening is also briefly examined, as is the importance of not being fearful of the seeming uniqueness of computer crime scenes. Finally, suggestions for future study are offered.

Locard's Principle of Exchange

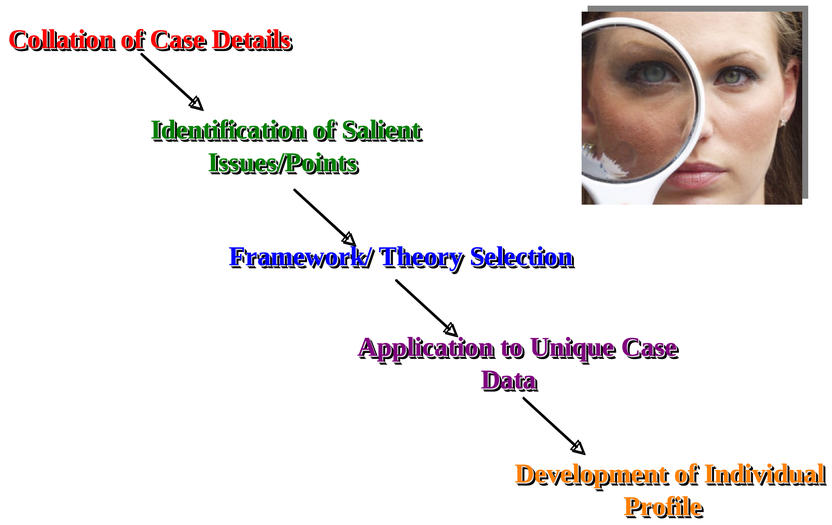
"When a person commits a crime something is left behind at the scene of the crime that was not present when the person arrived".



Crime Scene Phases

- **Recognition** – knowing what to look for, what constitutes potential evidence, and more importantly what can be ignored. This phase also includes the collection of the evidence.
- **Identification** – once evidence or potential evidence has been recognized, it needs to be identified. Identification consists of classification at the most basic level based on class characteristics (e.g., hair, blood, fingerprint). This acts as the foundation for the next phases.
- **Comparison** – the collected and identified evidence needs to be compared to some standard or control to determine that it came from a particular class (e.g., paint from a 1975 Ford Mustang).
- **Individualization** – the evidence is then further examined to determine any unique characteristics that would allow it to be differentiated from the larger category to a specific person, or entity/object based on its unique characteristics (e.g., paint from a 1975 ford Mustang owned by the primary suspect).
- **Reconstruction** – the last phase ties together the previous phases and allows the investigator to pull together the pieces of what has been to this point part of puzzle with no real picture to follow, into a logical sequence of events consistent with established timelines.

Profiling Process Model



Crime Scene Elements

1. Victim selection
2. Victim characteristics
3. MO of the offender
4. Attitude of the offender towards the victim
5. Offender's reaction to victim's behavior
6. Offender's language
7. Violence used by the offender
8. State victim was left in
9. Forensic evidence left at the scene

Mapping Crime Scene Elements

Conventional Crime Elements	Equivalent Cyber Crime Elements	Narrative
1) Selection of Victim	*Selection of Target*	This can be a person, system, network or range of addresses.
2) Characteristics of Victim	*Characteristics of Target*	System classification (business, military, financial, academic, home system, etc.), Security Controls (Anti-virus, firewall, IDS), Type of system (DB, Web server, transaction server, work station), Recent sites visited, Primary or Secondary target, Sensitivity of Data.
3) MO of Offender	*MO of offender*	System enumeration method, type of attack (DoS, scripted, Root-kit, sniffing, defacement etc.), warnings (pre-post attack scans).
4) Attitude of Offender towards the Victim	*Offender Attitude*	Threats & taunting, Chat group correspondence.
5) Offender's reaction to victim's behavior	*Offender Response Escalation behavior*	Any behaviors exhibited during the response escalation process.
6) Language used by the Offender	*Offender Artifacts*	Messages left on systems, messages sent to sys admins, coding "strings", location of attacker tools or files.
7) Violence used by the offender	*Potential Damage Rating*	Impact on Availability, Confidentiality, and Integrity of system, network or data, zombie.
8) State that Victim was left in	*Post Incident System Risk Rating*	Minimal, Moderate, High (needs to be reinstalled)
9) Forensic Evidence at Scene	*Forensic Evidence at Scene*	Log files, audit event trails, etc.

Future Research

Future research needs to extend the work that has been done in re-purposing traditional investigative support disciplines to the non-traditional cyber world. Specifically, future studies should attempt to validate the crime elements mapping approach (see table 1) to ensure that the proper analogous conventional and cyber elements are identified. Researchers should use some type of factor analysis to determine the minimum set of elements necessary to provide the most utility to investigators across various cases (e.g., virus attackers, insider fraud, intellectual property theft, identity theft). The area of cyber-victimology also requires more concentrated attention, especially with regards to the development of a victim typology.

"When you have eliminated all which is impossible, then whatever remains, however improbable, must be the truth."

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