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Original Article

The Relevant Physical Trace in Criminal Investigation

Durdica Hazard

Institute of Forensic Science, School of Criminal Justice, Ecole des Sciences Criminelles, Faculty of Law, Criminal Justice and Public Administration, University of Lausanne, Switzerland

Abstract

A criminal investigation requires the forensic scientist to search and to interpret vestiges of a criminal act that happened in the past. The forensic scientist is one of the many stakeholders who take part in the information quest within the criminal justice system. She reads the investigation scene in search of physical traces that should enable her to tell the story of the offense/crime that allegedly occurred. The challenge for any investigator is to detect and recognize relevant physical traces in order to provide clues for investigation and intelligence purposes, and that will constitute sound and relevant evidence for the court. This article shows how important it is to consider the relevancy of physical traces from the beginning of the investigation and what might influence the evaluation process. The exchange and management of information between the investigation stakeholders are important. Relevancy is a dimension that needs to be understood from the standpoints of law enforcement personnel and forensic scientists with the aim of strengthening investigation and ultimately the overall judicial process.

Key words: Clue, evidence, investigation, physical trace, relevancy

Introduction

Investigation scenes are the starting point of criminal investigations. They are successive but not alike, and require various resources from the members of the criminal justice system to appraise the events. Investigators, both detectives, and forensic science practitioners, have to decipher from places, persons, and physical traces what might have happened at a specific moment in time. Ultimately, the stories told by the investigators should be similar if not the same. This requires a strong partnership between them based on their communication and the quality of the information they exchange. The forensic investigator is just one of the many stakeholders in the criminal justice system. She reads the investigation scene in search of physical traces that should enable her to tell the story of the offense/crime that allegedly occurred.

Despite the current trend of standardization in the forensic science discipline,[1,2] there are some aspects of the task that cannot fit into any kind of standard operating procedures: The detection, the recognition and the collection of relevant physical traces at the scene. True leitmotiv for any forensic science specialist whether at scenes or in laboratories, the concept of relevancy is implicit and at the core of critical choices and contributions made by scientists within the legal process: Its study is essential to the foundations of forensic science. As Inman and Rudin[3] formulated it accurately:

> "The most difficult challenge in the investigative process is the recognition of relevant physical evidence. Prior to any laboratory analysis, an item must be recognized as evidence in a crime or it will never be examined, much less interpreted."

Identification of those relevant carriers of information depends on many factors and varies from one case to another, but also from one practitioner to another. For the sake of the whole judicial process, it is important to understand what the notions of relevancy, relevant physical trace and their corollaries mean for the stakeholders in the investigation.

This article provides a wide overview of research, conducted by Hazard,[4] which focused on the links between trace, clue, evidence, relevancy, and forensic investigators. First, it starts with a description of the analytical chain of evidence, stressing the point that sets apart trace from evidence notions. Then, a brief definition of the principle of relevancy within the forensic science discipline precedes a description of the environment that shapes the perception of what is relevant for the forensic investigators. Finally, reaching the stage

Address for correspondence: Dr. Durdica Hazard, School of Criminal Justice, Batochime, CH-1015 Lausanne-Dorigny, Switzerland. E-Mail: durdica.hazard@alumnil.unil.ch

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where the members of the criminal investigation assess the relevant trace, the methods of communication and the nature of the information exchanged between detectives and forensic science investigators are formalized. The aim is to demonstrate how critical it is to consider and combine their various perceptions of what might be relevant or not in order to strengthen the investigative phase and ultimately the whole judicial process.

Part 1: Criminal Investigation and the Analytical Chain of Evidence

"Information is transformed into evidence by an assessment of its relevancy to a particular investigation. Similarly, the degree of relevancy of evidence is established by assessment. The whole process can be visualized as a continuous range or spectrum extending from total irrelevancy to total proof. Thus, in a sense, assessment is the entire investigation."[5]

Almost 30 years ago, Kind[5] analyzed the inquiry process and came to the conclusion that the entire investigation relies on a multitude of assessments about the relevancy of information. Starting at the scene and following the progression of the criminal investigation, there are successive assessments of objects' relevancy that lead to information being understood differently. Kind[6] clearly expressed the distinction between specific notions such as information, evidence, and proof. This represents, to some extent, the analytical chain of evidence, except that there is a need to include the notion of physical trace, that is, the object providing the information. The analytical chain of evidence describes the process that information follows from the crime scene to its beneficiaries in the courtroom and intelligence units.

Indeed, the whole process of evaluation is based on the observations made at the scene by the investigators and detectives:

- The detectives search for information through the testimony of persons (victims, witnesses, suspects, etc.) and through other media such as telephone statements for instance
- The forensic investigators search the physical traces, left at the scene from the questioned activity and by the author of the investigated facts.

More specifically, the forensic science practitioner processes the investigation scene. She reads the scene as a book with the challenge of recognizing the relevant physical traces and of providing clues, to be used as evidence for the investigation or for intelligence, with the aim to reconstruct and prove the case's storyline. In the framework of an evidence-led inquiry, as Kind[6] emphasized, the status of the information evolves through a progressive and dynamic process, based on the assessment of the relevancy of the information. The information follows what is called the analytical chain of evidence and consists of essentially three main stages: The physical trace, the clue, and the evidence.

In this way, the physical trace is understood as "a mark, a signal, or an object that is a visible sign (not always visible by naked eye) and a vestige indicating a former presence (source level information) and/or an action (activity level) of something where the latter happened."[7] It exists without any given meaning, it is a primitive source of information available provided it is discovered and interpreted as being relevant. The physical trace has to be distinguished from the clue and from the evidence where a meaning process has taken place. The trace becomes a clue when the forensic investigator recognizes its valuable information content within a given context. The clue is "an apparent sign that indicates something with probability".[1] This constitutes one of the many threads (avenues) that can be followed to track down the investigated events, allowing consideration of alternative causes that might explain what has been observed at the scene. A discovered trace, perceived as being relevant in a given context, is a clue that gives information relevant to the case. Then, clues are gathered and become structured information about the case in issue. Clues become the evidence, understood as the information used by a magistrate, or another beneficiary of this information, to "raise or lower the probability of a proposition".[2] This provides the information with which to decide the most probable cause.

Interestingly, the three stages of the analytical chain of evidence fit into the three-chapter paradigm of evidence enunciated by Kind:[6]

- Finding and identifying the suspect (Chapter I)
- Solving the case based on a structured framework of information (Chapter II); and
- Proving the alleged facts with evidence (Chapter III).

The first chapter consists of searching the physical traces that might lead to a suspect; the second chapter consists in organizing the clues coherently, that is, the relevant physical traces and other information collected by all the investigators, to solve the case with structured information. The third chapter is dedicated to proving that the suspect is guilty based on evidence resulting from this analytical chain, which carried information from the investigation scene to the courtroom.

Ultimately, the assessment of relevancy lies behind the analytical chain of evidence and constitutes a critical process in the investigation. It is a manifold concept of importance to focus on, especially because the quality of physical traces that are discovered and collected at scene conditions the quality of the information used at the tribunal. In addition, such an attempt to differentiate the notions of physical trace, clue and evidence insists on the need to recognize peculiar

[1]"Indice". Alain Rey (Sous la direction de), 2010. Dictionnaire historique de la langue française. Le Robert.

[2]"Evidence". The Oxford Dictionary of Philosophy. Simon Blackburn. Oxford University Press, 2008. Oxford Reference Online. Oxford University Press. Universite de Lausanne. 30 March. 2015 http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t98.e1165.

steps associated with relevancy assessment. The study and understanding of the thought processes pertaining to the relevancy dimension highlight some key concepts intended to facilitate the communication between the various stakeholders of the investigation.

Part 2: Definitions of the Relevant Physical Trace and its Reasoning Framework

From the usual definitions, relevancy is presented as a logical and adapted relation: What is relevant brings information to the whole. The idea of the relevancy is fully realized when the keywords connection and context are taken into consideration. This leads to formulate the following enhanced definition: Relevancy is a logical and adapted connection between the qualified object and a question of interest within a given context. It has to be emphasized that the fact of being adapted generates a fragment of the answer, even the answer to the question asked.[4]

Despite the fact that some legal definitions of relevant evidence like the American rule 401 from the FRE[8] are often used as reference, there are no clearly given specific definitions as to what is relevancy and relevant information from a forensic standpoint and within a criminal investigation.

In forensic science, many practitioners mentioned and used the current notion, such as Locard[9] who presented the relevancy as being "the most serious and the most common defects"[3] or also Kind[5] who explained that it is through the intuition that the relevant questions are asked. They both agreed on the fact that sound experience and knowledge are needed to assess relevancy.

In the forensic science literature,[4] authors approach the question of relevancy from various perspectives or relations. This is clearly a many-sided concept used both to qualify a physical trace and the approach to searching, analyzing and interpreting the questioned trace.

For her research, Hazard[4] conducted interviews with forensic science practitioners and analyzed a short questionnaire designed to question the practitioners' conceptions of relevancy and relevant physical traces. The researcher also appealed to semiotic science, as the theory of sign and signification, to investigate the concept. This leads to a more complete definition of what is intended behind the forensic science relevancy tenet and what pertains to it as critical factors, influencing the evaluation of relevant physical traces within the framework of the investigation scene.

According to the semiotic view,[10] relevancy is defined as a perception of trace objects conditioned by the context and by what the forensic science practitioner decides to recognize at investigative scenes and to use as features from physical traces found at the scene of investigation. Combined with the collected answers of Swiss forensic science practitioners, a physical trace considered as being relevant can be defined more specifically in those terms:

The detected physical trace is perceived as being relevant because (1) on a factual and objective point of view, a link has been recognized between the discovered physical trace and the questioned (criminal) activity and (2) it is subjectively appropriate to collect and analyze it since there is a perception of its informative value by the investigators for the case at hand.[4]

The recognition and perception processes are ultimately dependent on the investigator within a defined environment. In the research of Hazard,[4] many parameters appeared as having influence in the relevancy assessment of the work at the investigation scene. These parameters were organized into three major dimensions that shape the framework into which forensic science practitioners assess, namely the situational, the structural and the individual dimensions.

The situational dimension includes all the parameters the investigators cannot clearly have an impact on. The first and most important is clearly the nature and gravity of the criminal case. This conditions the operational response of the criminal justice system: A homicide requires more resources in terms of staff, time, and personal investment than a burglary for instance. Next are environmental aspects (weather, location, time) as well as with the type of physical traces left by the offender at the scene (quality, quantity). Other factors are related to the persons the investigators have to work with, such as the first police officers attending and preserving the scene. Based on the quality of their intervention, traces might have been polluted, lost or well-preserved. Interestingly, the pressure imposed on forensic science practitioners by other stakeholders (such as detectives) to the investigation is a parameter, mentioned during the interviews, as an influence while they are processing the scene, and therefore assessing what might be relevant or not.

The second dimension relates to conventional and cultural aspects with the limits, means and constraints imposed by the organization and structure of the justice and police institutions. The penal procedure is clearly the first parameter to consider since it defines the legal framework of the investigative work. Institutional resources complete this framework. Practitioners emphasized the importance of a budget and work facilities, but also the efficiency of forensic databases, such as the fingermarks, shoemarks or DNA banks for instance. This has already been described by several authors, such as Girod,[11] Ribaux and Margot:[12] interest in specific physical traces also depends on the effectiveness and efficiency of the system (procedure, database) implemented to record the information and the capacity of the current system to value and use that information. The situational dimension orders a specific framework within which many parameters of the structural dimension are modulated and take place. In this context, management team

[3]Free translation of "le plus grave et le plus ordinaire des défauts".

[4]For a summary about the perception of relevancy dimension in the forensic science literature, see Chapter I, Research of Hazard, 2014.[4]

balance budget facilities and operational priorities, and will decide to stress the attention on specific criminal phenomena to the detriment of other criminal activities. Furthermore, some investigators mentioned that some practices were more accepted within their unit than others: A practical example was given by a young forensic investigator who was told by peers that for pragmatic reasons, pictures were not specifically recorded for small cases investigated by the unit. Even though he was feeling more comfortable taking pictures for all cases, he did not want to go against the unofficial rule. He feared that it might be noticed by the management team, who could have decided to make it mandatory and resulted as an extra-task for the rest of the unit. Such conventional dimensions might have a strong impact on practice and consequently limit or refrain people from doing specific activities that could be fruitful.

The third dimension is the individual one. The forensic science practitioner has her own stock-in-trade (knowledge, experience, and education)[4] and her own limits based on the previous two dimensions. The investment into the search, assessment, and collection of relevant physical traces depend on the personal motivation, the moral and physical states of the forensic science practitioners. More specifically, the research of Hazard[4] showed the importance of the individual stock-in-trade of the forensic science practitioners for the relevancy assessment; this may change substantially from one investigator to another, and may have a strong influence on the approach and the relevancy assessment at the investigation scene.

Thus, a number of parameters influence and shape the environment within which forensic science practitioners search and perceive what could be relevant or not. As Schamber *et al*.[13] said: "Relevance is a multidimensional cognitive concept whose meaning is largely dependent on users' perceptions of information and their own information need situations." Since it is a conventional and personal concept assessed by the forensic science practitioner, there is a high probability of having different points of view among the various stakeholders of the investigation process on what is relevant to do, to collect, and to analyze. These differences require comprehensive and efficient exchanges between investigators around this concept to understand fully each other's motivation.

Part 3: The Synergy within the Investigation Process

"Contextual elements must be used in the selection process on the scene of an investigation. Detection and observations highlight the presence of the trace whose significance may be tested through alternative hypotheses at different levels."[14]

To search, detect, recognize, and collect relevant physical traces calls for dynamic communication between stakeholders. Kind[5] stressed the necessity for collaboration between investigators, demonstrating how complementary their perceptions of the inquiry could be. This complementarity can be approached through two specific activities of the investigators: The management of the information and their own reading of the investigation scene.

Among the multiple actors of the criminal justice system who take part in the inquiry, there is a multitude of interactions with different sources of knowledge of various qualities. Investigators have to deal and assess a large amount of data in order to use it in a very efficient way.

Colleagues from detective unit are clearly a crucial source of information for the forensic investigators. The detectives' inputs may help the forensic practitioners to target their approach at the scene with a more precise idea of what they could search for. This also provides a more definite context of the events. It offers a circumstantial reasoning framework for the forensic practitioners where the relevancy of the detected trace can be recognized. Indeed, based on their first perception of the case and the detective's contribution, the forensic investigator may approach the scene with the ability to contextualize more easily what she detects, meaning that she can assess more confidently whether the physical traces discovered have a logical presence within the given context. For instance, take the detection of an earmark on a door of a burglarized apartment. If the nature of the source is easily recognizable (i.e., the origin of the trace is an ear), the activity that has left this mark on this specific door is worth consideration. Based on the information provided by the detectives, the trace can have a legitimate presence or not. One explanation could be that some kids played around and listened to the doors leaving their marks, or there would be no other explanatory activities except a burglar listening to the doors that could explain the presence of the current marks.

On the other side, the clues collected by forensic investigators have great potential to open new leads for investigation by the detectives, if they have not found reliable material to direct the inquiry from their own pool of information. Good examples are DNA and fingermark evidence providing the name of a potential suspect or a link with another criminal case.

The second activity where synergy is needed is in the reading of crime scenes. Detectives and forensic investigators read the scene and perceive the criminal case differently. Perception is by definition an intellectual operation specific to the individual;[5] thus, their perceptions of what can be relevant or not depend on their interests. Indeed, this influences strongly what could be regarded as interesting to collect and analyze.

The following quote is extracted from an interview with a Swiss forensic investigator. She explained the different perceptions of relevant information for a detective and a forensic investigator. "Because he [the detective], he thought that, for his investigation, it was relevant to have such physical traces. On my own

[5]"[…] act, operation of intelligence, intellectual representation", free translation from "[…] Acte, opération de l'intelligence, représentation intellectuelle". Alain Rey (Under the supervision of). Dictionnaire historique de la langue française. Le Robert. 2010

perspective, this was not relevant because [the shoemarks] were in an open space to the public. But, […], I understood what his interest was, and I did [collect] for him." Extract of an interview conducted with a forensic investigator.[3,4]

There is a strong need to understand the investigators' perspective and motivation, in order to reinforce the investigation process by providing clues that will be used efficiently and will allow investigators to move from the problem to find to the problem to solve and finally to the problem to prove the case (which is more the province of the court).

Confronting the various crime scene readings among the stakeholders may also have an impact on the penal classification of the activities. The forensic investigator will, for instance, read blood patterns in a way that the most probable scenario would be "the offender was located in a specific area of the scene;" while the detective might have understood something else regarding the position and implication of the suspected offender. Discussing their understanding of the events can shed light on incoherencies. Such discrepancies can demonstrate a wrong statement from the suspect who might try to minimize his own implication in the case; this can change the penal consequences of the role he played in the events.

Exchanging point of views about the scenarios will highlight relevant matters, such as considering whether the investigators should keep on looking deeper into the scene to find more clues, or discussing what appears to be crucial to be analyzed for the sake of the inquiry.

In brief, by confronting their reading of the scene and their own perception of relevant matters, investigators are more inclined to understand their colleagues' needs and then to assist them to get the required information. Then, relevancy appears as a dimension that can act as a focus point of discussion not only between the investigators but also the other stakeholders of the inquiry.

Conclusion

The relevant physical trace is a clue that provides various means to follow the thread of the alleged criminal story. Questioning the relevancy of the discovered trace is part of a control process of the information carried by the collected items; because once the forensic findings are introduced into the judicial process, there is at some point a loss of control regarding the way the information coming from the scene will be understood and used. Thinking about relevancy requires one to question the nature of the physical trace detected (is it a contamination or not?), to recognize a factual link with the case, to consider the detection method to use, and to assess the appropriateness for the analysis and the informativeness of the trace within the given context. The situational, structural and individual dimensions shape the approach and interactions of the forensic investigator with the other actors of the criminal justice system present at the scene; therefore these dimensions influence the relevancy assessment. Following the three-chapter paradigm of Kind, the problem to find and to solve relevant material is a serious concern for the detectives and forensic science practitioners. The synergy of the investigators' approaches is clearly a key issue to study with the aim of strengthening the inquiry. The investigation is a complex process. It is essential to "play" with the multiple perceptions of what is relevant for the various stakeholders and to take benefit from such heterogeneous interests while processing and investigating the scene.

Studying and questioning dimension that pertain to forensic science, such as the relevancy, will strengthen its underpinnings and help define it as a complete and independent discipline with its own culture.

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