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*Criminalistic information and data bases*

# IMPORTANCE OF CRIME INVESTIGATION AND PROPHYLAXIS

***EGLE KAZEMIKAITIENE, ASSOC. PROF. DR.,***
*Mykolas Romeris University, Vilnius Criminalistic Department.*

The main objective of criminalistic databases and collections is providing information for the investigation and prevention of crimes and other violations of law. Research contemplates the definition of criminalistic information, the utilization of criminalistic databases and other records within the criminal justice system, especially for crime prophylaxis. The unified criminalistic information system can ensure that investigators will be provided with reliable information as early as possible. New information technologies open up new possibilities in detecting criminals and investigating of crimes. This paper considers the methods of knowledge representation helpful in the management of the repository of a criminalistic information system. The development of an advisory system in the domain of crime investigation deals with incomplete and uncertain information provided in the broad variety of data sources ensuring many forms of intellectual analysis and situation evaluation methods. New possibilities of of knowledge representation are examined for the purpose of preparing the qualitative intelligent systems for crime investigation. A unified approach is proposed for integrating different databases and techniques of knowledge representation for easier identification of relevant patterns and investigation of crimes.

***VOCABULARY***

***repository:***
*Speicher, Lager*

## INTRODUCTION

One of the most important trends of the stage of development is the improvement and optimization of crime investigation work. Criminalistics – the science, of which the main task is the preparation and implementation of crime investigation, detection and prevention methods and measures, plays an important role in realization of such an objective.

Since 1 May 2003, a new Criminal Procedure Code of Lithuania has been in force. It has resulted in quite a lot of theoretical and methodological tasks for criminalistic science. It is necessary to solve the problems of the theoretical and practical backgrounds of the criminalistic prophylactic task, because there are no direct prophylactic juridical norms in the new Criminal Procedure Code. So, further formulated methodological background of criminalistic information should be specified.

The Lithuanian Criminal Procedure Code is the main law regulating implementation of criminalistic measures, means and methods (both prophylactic) in practice of crime investigation. Criminality as well as crime prevention were always con-

sidered to be particularly complex processes covering both scientific (theoretical) and practical aspects. The issue regarding the fact what measures should be used in order to influence criminality and how to make people tending to commit criminal acts stop their criminal activity makes scientists and practitioners more and more concerned.

The success of crime investigation and prophylactic activities is highly dependent on the fact whether the pre-trial investigation is conducted thoroughly, whether data on separate elements of the composition of the crime are collected and also on the reasons and conditions that preconditioned the crime. When gathering and verifying information needed for the investigation of a criminal act, actions of the pre-trial investigation must be the most important procedural sources of information on the reasons and conditions having preconditioned the commission of the criminal act.

The main task of research is the complex exploration of the use of criminalistic information sources on the modern stage of development of criminalistic science.

***VOCABULARY***

***procedural:***
*prozeßtechnisch, verfahrenstechnisch*

***evidentiary:***
*überzeugend, auf Beweisen beruhend*

## THE OBJECTIVES OF RESEARCH

- to specify the definition of criminalistic information according to the development of implementation of opportunities of criminalistic science;
- to present problems of crime analysis;
- to describe knowledge representation of of the domain of application of crime investigation;
- to establish by accomplishment whether the pre-trial investigation procedure officers who are obtaining criminalistic information about causes and conditions, are succeeding in revealing information about how crimes are arranged, committed or hidden.

## DEFINITION OF CRIMINALISTIC INFORMATION

One of the most important definitions of criminalistics is information. A number of authors[1] understand information as "facts about the surrounding world, about the inner condition of system and surrounding conditions, facts that command system uses for realization of command processes, information that joined both facts about persons and facts that are independent of the person's consciousness" or "the basis of all definitions of information is the proposition, that it is knowledge about the surrounding world as an object of keeping, transmission, operation".

In my opinion, for determining the definition of information, one can predict:

1) information is knowledge and facts about processes of life, both in the criminal world; it means criminalistically important knowledge;
2) such knowledge is accepted by living organisms, command machines, other information systems;
3) the aforementioned recipients of knowledge and facts accept it unintentionally of their wish and not only for keeping it in their minds, but for the purpose of processing and supplying information.

***Different information is used in separate human activities; it is determined by the character of human activity.***

So, there is separate economical, social, political, personal, medical, biological, juridical and other information. In juridical literature and practice such types of information are mentioned: evidentiary, legal or juridical, criminalistic, operative, investigative, criminalistically relevant.[2]

Crime investigation activity has an informative Character too; it has joined information reception, handling and storage

processes and processes of putting them to use, it means processes of discovery of evidence, fixing and employment for investigation purposes.

The definition of criminalistic information depends on the definition of criminalistics; it should fit the context and object of criminalistic science. So, developing a perception of the nature of criminalistic science changes the definition of criminalistic information.

***Criminalistic science constantly develops and opportunities for criminalistics always arise.***

The modern objectives of criminalistic research are not only restricted to creating criminalistic technical means, measures and methods as well as its implemention of it in the crime investigation process. It is an important process of crime activity genesis, during which circumstances and factors determine and stimulate committing of a crime. The reasons and conditions causing crime to be committed, influencing criminal attempts and the structural components of crime mechanism, both are important evidentiary circumstances in criminal cases.

***So, criminalistic science has a crime prophylaxis function.***

A complete analysis of the object of criminalistics helped to reveal, that one of the objectives of criminalistic science is to develop criminalistic prophylactic methods, means and measures.[3] We can find different opinions concerning the place of criminalistic prophylaxis in the system of criminalistic science in literature.[4]

Criminalistic information is such information that helps to restore the model of the crime committed and other important case circumstances. Some authors[5] predict that criminalistic information consists of systematized facts about people, dead bodies, ways of committing crime, stolen goods, traces of crime and material evidence, and about other objects that are important for crime investigation. I think that such definition is not accurate and too narrow.

One can agree that criminalistic information consists of particular facts that the investigator receives according to the recommendations of criminalistic science by procedural or nonprocedural ways during crime investigation; and it could be evidentiary material relevant for the case.[6]

So, criminalistic information is firstly a reflection of a criminal event and its investigation. It describes the circumstances of a criminal event, its mechanism and separate patterns of how crimes are commited. Circumstances causing the committing of a crime are classified as the circumstances of a crime event, so criminalistic information describes it too.

Criminalistic information concerning circumstances causing crime could be received from different sources. Often the source of such information is a certain criminal event: subject, injured person as crime object, injured person as witness, environment of the crime (surroundings, where the crime was prepared, implemented and hidden), witnesses, investigators (specialists, experts, operative workers, pre-trial investigation officers, prosecutors, judges), fixed criminalistic information, and all objects and subjects directly and not directly involved in the criminal event. Thus, sources of circumstances causing crime are presented as in Figure 1 (page 28).

Criminalistic information about circumstances leading to a crime could be received both by procedural and non-procedural forms. Information received in a proce-

***VOCABULARY***

***narrow:***
*eng, begrenzt*

***injured:***
*geschädigt, benachteiligt*

Grafik: Kazemikaitiene

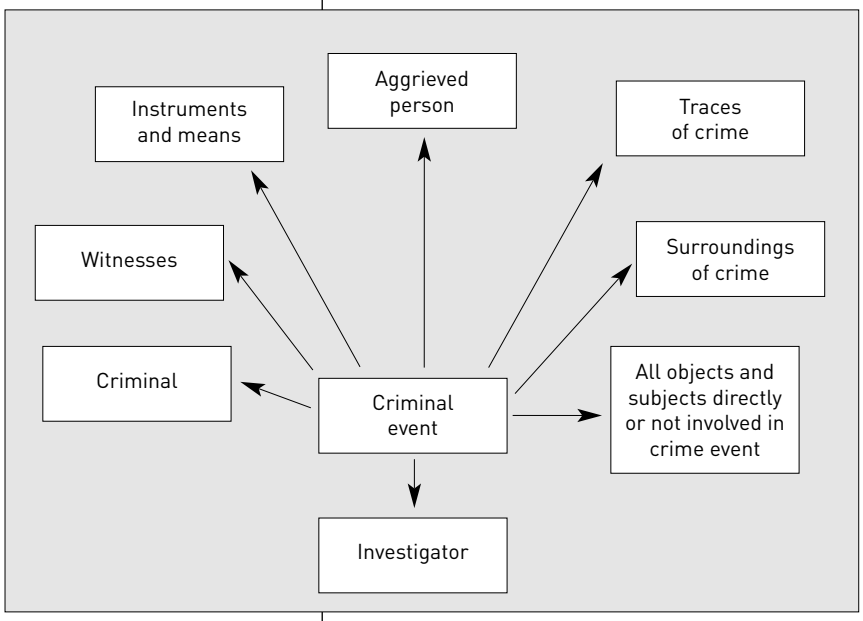


**Figure 1. Sources of circumstances leading to crime.**

dural form is information received by the accomplishment of pre-trial investigation activities. It is evidentiary information; it means all information connected with the evidentiary object.

Information received by non-procedural forms is information received by operational activities; information received during the accomplishment of law enforcement and the functions of other institutions (except criminal procedural functions), for example, administrative practice; information, received by scientific research undertaken in the criminalistic field, the conclusions of experts, trials or pre-trial investigation practice. Information received in a non-procedural way is not used in the evidentiary process, but it is widely used in the selection of investigation strategy and tactical methods. Therefore it is titled as orientation, supporting or operational. In our opinion the latter is the most correct one, because operational information consists of facts that are received mostly by non-procedural ways.

So, sources of criminalistic information are material and immaterial (ideal) objects that are connected by criminal event circumstances of the committed crime and that collected information about such circumstances.

As an example, we will consider one of the sources of criminalistic information, from which important prophylactic information is received – it is pre-trial investigators, fixing criminalistic information concerning circumstances causing crime, in particular procedural documents.

One should note that circumstances leading to a crime are established during the evidentiary process.

***During a pre-trial investigation, one part of the evidentiary process is collecting and checking the information, on which the investigator bases his conclusions of the case.***

The most important role of pre-trial investigation activities is collecting and checking information. Pre-trial investigation activities are one of the main sources of discovering circumstances leading to crime. According to Belkin[7], the context of pre-trial investigation activities should not be limited only to collecting and examination of evidence. During the accomplishment of such activities, the investigator can receive information about circumstances as to how the crime has been committed. For example, during the interrogation of a suspect or a witness, the investigator tries to receive information not only about facts of the investigative event, but also to establish, why the crime was committed, who did not interfere or help to commit it. Other pre-trial investigation activities should have this task.

During the whole pre-trial investigation we can receive information concerning circumstances leading to crime.

The effectiveness of establishing such circumstances depends on the system of investigator activities that is ensured by proper planning of case investigation. So, when the plan of primary investigation activities and versions is being created, the activities concerning the establishment of circumstances of the crime should be predicted.

## PROBLEMS OF CRIME ANALYSIS

The crime investigator and the crime analyst are of increasing importance to provide the best use not solely of new techniques but also of scientific approaches during the whole investigation process. Traditionally, each crime scene is seen as an independent 'complete' set of data from which the intelligent investigator can find the signature of the offender. Links between cases are often inferred through police investigation in a separate process; cases are also compared through the use of physical evidence collected at the crime scene.

Crime analysis aims at thoroughly deciphering the knowledge used by experienced investigators to identify and formalize concepts and notions, and the methods used by them to manage their information. We also deal with conceiving new methods of treating data, and adapting existing ones, given that computer tools can improve the analyzing process in a way that was not possible before.

***Normalizing language and symbols are used in the course of the analysis in order to facilitate team work on complex problems, and to disseminate the results of the analysis in a way that is easy to interpret.***

Using those methods, the advisory system under development must produce relevant conclusions or hypotheses that can help towards concrete actions.

A broad variety of forms of analysis could be defined. For instance, crime pattern analysis, profile analysis, case analysis (course of events immediately before, during and after a serious offence), comparative case analysis, etc.

## KNOWLEDGE REPRESENTATION OF THE CRIME INVESTIGATION APPLICATION DOMAIN

The development of an intelligent system in the crime investigation domain requires the application of additional methods, their task being the description of situations, revealing relationships between people, scenes of crimes and objects, as well as helping to develop working hypotheses and decision support. When analysing the components of intellectual information systems, attention is focused on the alternatives: how to display legal information, which methods to use for decision-making in crime investigation, what procedures are used in judicial systems, etc. For that reason we are trying to define the purposes of applying these methods, including decision making problems in the judicial system.

The specificity of judicial system fields most frequently involves the problems of structuring and describing the phenomena formalised. Structural system analysis becomes an interesting problem when analysing the steps of developing an intelligent information system. The knowledge that enables us to understand how to apply the methods of decision preparation is of special importance. Means of reasoning, methods of proof are among the concepts used in the intelligent information systems. Intellectual information systems have the additional characteristics that enable structuring and storing data in the system, modelling situations, making and explaining hypotheses.[8] In most instances the complex structure of legal information

***VOCABULARY***

***to infer:***
*ableiten, folgern*

***to decipher:***
*dechiffrieren, entschlüsseln*

Grafik: Kazemikaitiene

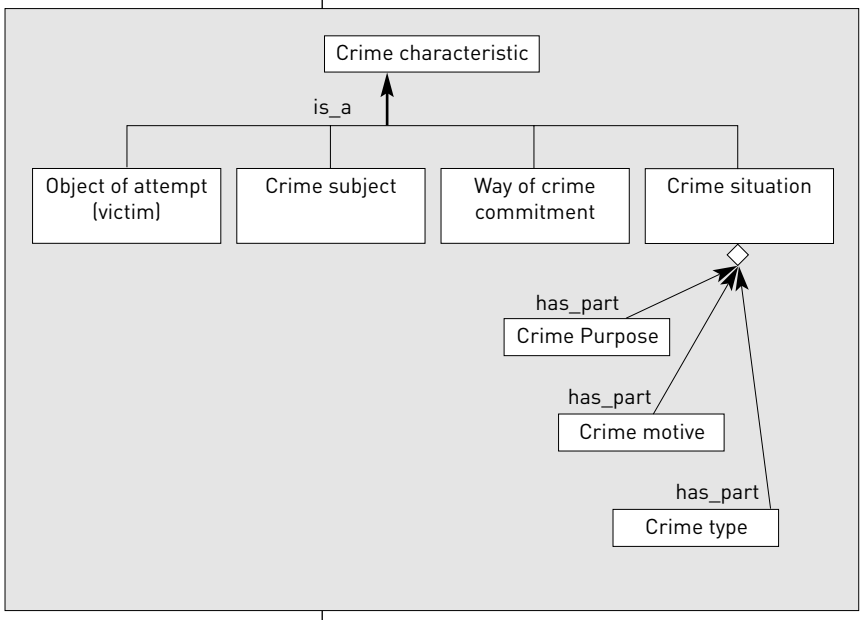


**Figure 2. An example illustrating a crime characteristic model**

and knowledge can't be expressed by single formal means. Other possibilities for the integrated use of these methods have to be sought.

An important task is the development of a common computer-based working dictionary of the law enforcement system. In order to become familiar with the principles underlying the development of such a working dictionary, the methods that enable us to define the concepts and associations used in judicial system as well as the level of concord between concepts and their equal comprehensibility are discussed.

***The methods of developing the legal ontology and presenting it in a computer network play an important role in the solution of this problem.[9]***

An example of representation of the characteristics of a crime is shown in Figure 2. An example of crime hierarchy is presented in Figure 3 (page 31).

In addition, the knowledge system must comprise abstract information and data about the current situation and have the possibilities of retrospective analysis and prognoses.[10] Automatic selection and management of the rules, suitable for the assessment of a particular situation, is performed in the expert systems. Core and shell mechanisms of the expert system ensure the presentation, sorting and selection of the rules.[11] As a result, the user is given a simple interface to enter the primary rules in a suitable natural format, e.g. image enhancement by computers has emerged as a forensic examination method in its own right. In latent print examination, quantitative digital image processing relative to automated fingerprint identification systems (AFIS) has been going on for over 20 years.[12]

Case-based reasoning is a computer-based method, which analyses the solution of problems solved formally on the basis of analogy or associations with the solution of a current problem. Case-based reasoning has several advantages over productive systems: case-based reasoning is closer in nature to the factual processes of human-made solutions; the expert, having been presented with a problem, initially compares this problem with problems already solved earlier determines its individual similarities. Should the case-based system fail to arrive at a desired conclusion, new rules are to be made and added to the knowledge base.

## RESULTS OF EMPIRICAL RESEARCH

The research was based on empirical research results collected by interviews. In 2006, investigators of the Crime Investigation Board of the Lithuanian criminal police and prosecutors were questioned by means of questionnaires that were created by the author of the thesis. 399 respondents were questioned. The interviews of

***VOCABULARY***

***representation:***
*Darstellung, Ausführung*

***factual:***
*sachlich, sachbezogen*

74 experts of the Lithuanian Police Forensic Science Centre and the Forensic Science Centre of Lithuania and the Lithuanian Ministry of Justice was carried out in 2005. This research evaluated the examination practice in the crime prevention field during the years 2001–2006.

***The completed empirical research showed that 84,2% of the pre-trial investigation officers receive criminalistic information concerning circumstances of the crimewhile carrying out pre-trial investigation activities.***

Criminalistic information concerning circumstances that result in crime is received by the same pre-trial investigation activities that help to reveal others circumstances of the criminal event investigated. Investigators carrying out pre-trial investigations can receive information concerning circumstances which caused a crime to be committed by most pre-trial activities set forth in the Lithuanian Criminal Procedure Code. Some pre-trial investigation activities by which such information is received are accomplished more often than others. It improves our empirical research. Respondents, who predicted that they receive criminalistic information about circumstances leading to crime, pointed out such pre-trial investigation activities.

***Practically almost no case investigation can be accomplished without such an investigative activity as interrogation.***

In most cases, interrogation is the main, sometimes sole, source of information that helps to reveal crime and to establish the guilt of persons and information concerning circumstances leading to a crime. During interrogation, the pre-trial investigator receives information that could be important for crime prevention, for analysis of the personality of guilty persons, as well as forms and context of their unsocial attitudes. Interviews of pre-trial investigators and prosecutors showed that they accomplish interrogations mostly in practical work, when they are receiving information about circumstances concerning the crime (87,2%).

Article 196 of the Lithuanian Criminal Procedure Code regulates the completion of another kind of pre-trial investigation activity – testimony inspection on the crime scene. The definition of the testimony inspection on the crime scene, presented in criminal procedure law, is relevant for only one task – to check and specify the obtained testimonies obtained. According to Averjanova T.V.[13], the task of this activity should be not only to examine and add evidence found, but to receive new evidence, both concerning crime

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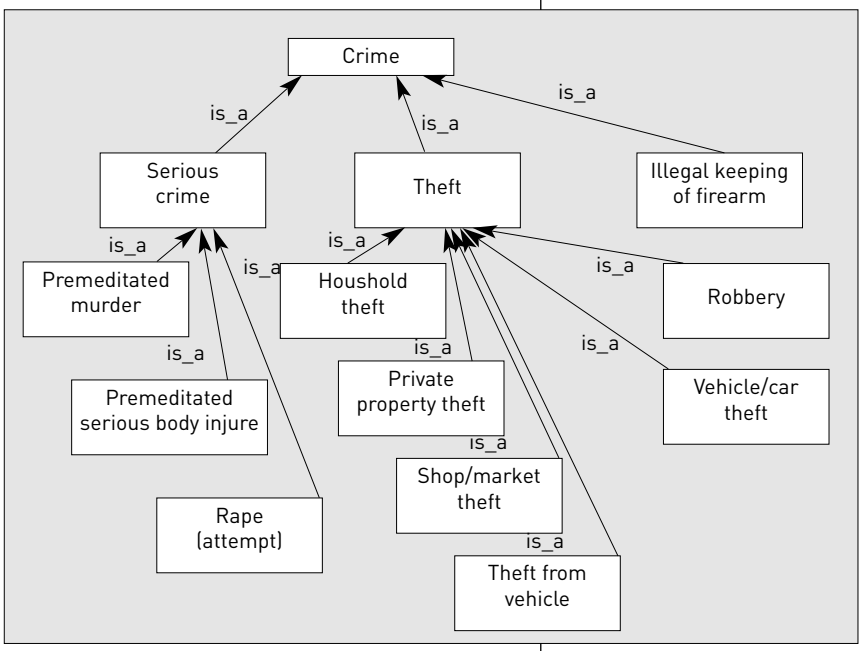


**Figure 3. An example illustrating crime hierarchy in the ontological layer**

***VOCABULARY***

***testimony:***
*Zeugenaussage*

composition and circumstances causing the crime to be committed.

Investigators receiving information during testimony inspection on the crime scene can use it both for checking criminology circumstances and for checking testimonies of suspect, witnesses, defendant, injured person. Interviews of pre-trial investigation officers showed that in the investigative activity, they often succeeded in their search to receive information concerning the circumstances of the crime.

***Demand for various scientific, technical and other special knowledge always arises during pre-trial investigation.***

Here examination and object investigation play important roles. Experts and other specialists can help to receive important criminalistic information for investigating the case, in addition to information concerning circumstances regarding the crime. The interviews showed that 14,8% of respondents asking judges to appoint examination or appointing object investigation by themselves, always carry out activities to obtain information concerning circumstances surrounding the crime. It is disappointing to admit that 51,3% of respondents do not use special knowledge for receiving information concerning circumstances leading to crime.

***Confrontation and experiment are further important pre-trial investigation activities.***

While accomplishing experiments, the investigator can establish such types of criminalistic information as:[14]

a) which circumstances eliminated or created opportunities for committing a crime;
b) what organizational, administrative or technical means should be implemented in order to make commiting such crimes difficult or impossible.

But experimentation is used very rarely in investigative practice. Only 6,8% of respondents said that they always receive information concerning circumstances resulting in a crime being committed, and – as many as 66,5% – never.

**CONCLUSIONS**

Knowledge representation methods play an important role in solving decision-making problems for the development of the advisory system in crime investigation processes.

A unified approach of integrating different data bases with knowledge for aiding advisory processes in relevant pattern recognition and crime investigation is proposed. A key part for enforcement of this approach is to understand those activities, through the development and use of methods, models and tools for collecting and then interpreting the large volume of data available in real time for crime investigation.

***The ontological view based on an object-oriented model helps us to reveal knowledge and examine the main principles of the domain.***

Consequently, the main principles of creating a knowledge intensive framework have been developed, leading to recognition of a field of activity called crime analysis, which has been described as 'the identification and the provision of insight into the relationship between crime data and other potentially relevant data in view of police and judicial practice'.

Empirical research has shown that pretrial investigation officers seeking to receive criminalistic information about

circumstances leading to crime should primarily carry out such pre-trial investigation activities as interrogation, crime scene surveys and surveys of goods.

The research revealed that not all opportunities of using criminalistic information concerning the circumstances regarding crime are used in pre-trial investigation practice and that some of the pre-trial investigation activities are accomplished very rarely for such purpose. So, criminalistic information is not only information concerning evidentiary circumstances in the case but also information concerning circumstances leading to crime, and it should be used properly for crime analysis and prophylaxis.

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