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Editorial Words

Dear esteemed readers,

It is my great pleasure to welcome you to the latest edition of ASEJ, the academic journal that brings you the latest research in the fields of law, economics, logistics, finance, psychology, criminology, computer science, and security. This issue features a diverse range of articles from leading experts in these fields, showcasing their latest research and insights into current trends and challenges.

As we continue to face unprecedented challenges and rapidly evolving technological advancements, it is more important than ever to stay up-to-date with the latest research and trends in these fields. This issue of ASEJ offers valuable insights and perspectives that are essential for anyone seeking to stay at the forefront of their respective disciplines.

We would like to take this opportunity to express our sincere gratitude to the authors for their hard work and contributions to the advancement of knowledge. We would also like to acknowledge the invaluable support of the Bielsko-Biala School of Finance and Law for their continued commitment to publishing this journal, which serves as a platform for the exchange of the latest knowledge and insights.

Virtual reality (VR) technology has been advancing at a rapid pace, and with its growth come a range of challenges in various fields, including economics, law, security, and computer science. In the realm of economics, one challenge is determining how to integrate VR technology into existing business models. VR has the potential to revolutionize the way companies conduct business, but it also requires significant investment and infrastructure to do so. Additionally, there are concerns about how VR will impact the job market, as it could potentially eliminate the need for certain types of jobs while creating new ones in the VR industry.

In this issue, we also explore the growing significance of virtual reality in law, economics, finance, and security. As VR technology continues to evolve, it presents both opportunities and challenges in these fields. For example, in economics, VR has the potential to revolutionize the way businesses operate, but it also requires significant investment and infrastructure. In law, the use of VR raises important questions around data protection, privacy, and intellectual property rights. In finance, VR can be used to enhance customer experiences and provide new insights into investment opportunities. In security, VR presents new risks and challenges, such as ensuring the safety of users and protecting sensitive data from cyber threats.

We hope that this issue of ASEJ will prove insightful and informative for our readers, and we look forward to your feedback and contributions in future editions.

Sincerely,

Dr Muhammad Jammal
Editor of the ASEJ, Issue 4, Volume 26, 2022

Cooperation of psychology and criminology in investigative activities

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Abstract— **Forensic science and psychology are two interdisciplinary fields of study that often work together to effectively investigate crimes (Goc&Gruca 2020). Criminal psychology studies the behavior of criminals, their motivations and psychological profiles. Criminal psychologists help to determine who could be suspected of committing a crime, based on behavior and other characteristics that are related to the crime (Widacki 2018). These psychologists can conduct psychological examinations of suspects, victims or witnesses to determine their role in the incident and increase the chances of a successful investigation.**

Forensic work includes laboratory tests, the use of modern technologies and tools, as well as data analysis. Forensic science plays an important role in the prevention of crime and in the justice process (Szydlowski 2016), helping to identify and prosecute the perpetrators of crimes and to ensure the safety of society. Collaboration between forensics and psychology can help identify suspects based on behavior and characteristics and use scientific evidence to conduct successful investigations. In the case of crimes involving people with mental disorders, criminal psychology can help to understand their behavior and assess the risk of recidivism (Czudek&Szydłowski 2022).

In this way, cooperation between forensic science and psychology can be very effective in carrying out investigations and investigations, as well as in preventing crime and improving the security of society.

Keywords— forensic science, artificial intelligence, investigative psychology, criminal psychology.

I. Criminal psychology and investigative psychology

Criminal psychology and investigative psychology are two related fields of psychology, but they differ in their scope and methodology of work.

Criminal psychology deals with the study of the behavior of criminals, victims and witnesses of crime (Canter&Youngs 2009). It analyzes the causes of criminal behavior, patterns of their actions, motivations and tendencies, as well as the effects and social reactions to crime. Criminal psychology can be used in profiling criminals, diagnosing mental disorders in defendants and preparing witnesses for testimonies (Hołyst 2018).

Investigative psychology is a branch of psychology that focuses on applying psychological methods to gather information, analyze evidence, and give expert testimony in criminal trials. Investigative psychologists can conduct tests to determine the veracity of testimonies, identify suspects, assess the memory and perceptual skills of witnesses, and conduct research on suggesting questions and suggestions in testimonies (Stanik 2013).

Thus, it can be concluded that criminal psychology deals with the study of the causes and effects of crimes and the behavior of people related to crimes, while investigative psychology uses psychological knowledge to provide forensic expertise and collect and analyze evidence in criminal trials.Use of artificial intelligence in forensic psychology and forensic science is already possible and increasingly common (europarl.eu). Artificial intelligence systems used in the analysis and processing of large amounts of data, such as crime databases or city surveillance video, are becoming particularly popular. One example of the use of artificial intelligence in forensic science is the automatic face recognition system (politykabezpieczenstwa.pl), which allows people to be identified based on photos or video recordings. Another example is a natural language analysis system that allows you to analyze texts and identify potential threats. Artificial intelligence can also be used to analyze the behavior of criminals, which allows to develop a psychological profile of the perpetrator and identify his motivation. In this way, you can increase the effectiveness of investigations and help to catch the perpetrator of the crime.

However, it should be remembered that the use of artificial intelligence in forensic science may raise some controversies and challenges, such as privacy and ethics issues. This requires the development of appropriate standards and procedures and the provision of appropriate training for professionals using

these technologies. The use of artificial intelligence in forensic psychology and forensic science has many possibilities and can be very effective in the fight against crime. However, it should be remembered that this requires an appropriate approach and compliance with standards and procedures to ensure the fairness and reliability of the proceedings.

II. FORENSIC - ITS VARIETIES AND TECHNIQUES

Forensic science is a field of science that deals with the study of crimes, their causes, and ways of committing and identifying people associated with the crime (Hołyst 2017). It is an interdisciplinary field that uses the knowledge and methods of such fields as forensic medicine, chemistry, physics, computer science, psychology and biology.

Forensic science is divided into many specializations, the most important of which are (Hołyst 2017):

1.   Dactyloscopy – the science of fingerprints, used to identify people associated with a crime.
2.   Ballistics - the science of firearms, used to study bullets, shells and other elements related to the use of firearms.
3.   Toxicology - the science of toxic substances, used to study the content of toxic substances in the body of victims of crime.
4.   Forensic anthropology – the study of the human body, used to identify corpses and determine causes of death.
5.   Forensic genetics - the science of genetics, used to identify people associated with a crime based on DNA testing.

In addition, there are also other specializations in forensic science, such as documentology, i.e., the study of documents, graphology, i.e. the study of handwriting, and computer forensics, dealing with the detection and prosecution of crimes related to the Internet.

Thanks to the use of forensic methods and tools, it is possible to conduct effective investigations and identify the perpetrators of crimes. These methods allow for the collection and analysis of evidence, such as fingerprints, DNA, traces of crime weapons, biological materials or monitoring records (Kwiatkowska-Wójcikiewicz 2019).

However, some forensic methods are controversial, such as the use of identification based on the analysis of DNA from the relatives of suspects or analysis of the behavior of suspects. Therefore, it is important to use these methods with due care and in accordance with the law.

Forensic science is a field of science that is extremely important in combating crime. Thanks to the use of forensic methods and tools, it is possible to identify the perpetrators of crimes and conduct effective investigations.

Forensic methods and techniques are a broad field, encompassing many different tools and technologies for collecting, analyzing and interpreting evidence related to crimes. Some of the most important forensic methods and techniques are (Hanusek 2009):

1.   Trace analysis: involves the collection and analysis of various types of traces left at the crime scene, such as fingerprints, hair, skin, blood, shoe marks, murder weapons, etc.
2.   DNA analysis: involves the identification of DNA from biological samples such as blood, saliva, semen, etc. This method makes it possible to identify the perpetrators of crimes and exclude innocent suspects.
3.   Ballistic analysis: This involves analyzing bullets and shells to identify the type of weapon used in a crime and determine the direction of the shot and the distance to the target.
4.   Document analysis: involves analyzing various types of documents, such as letters, invoices, contracts, etc., in order to determine their authenticity and detect forgeries.
5.   Computer analysis: involves collecting and analyzing data from computers and other electronic devices to identify suspects and prove their guilt.
6.   Audio expertise: involves analyzing sounds and recording voices to determine whether a person was present at the crime scene and to identify the voice of the suspect.
7.   Criminal analysis: involves analyzing the motives, modus operandi and other factors that can help determine the identity of the perpetrator of the crime.

A. Trace analysis

Trace analysis is one of the most important methods used in forensics. It consists in collecting and analyzing various types of traces left at the crime scene, such as fingerprints, hair, skin, blood, shoe marks, murder weapons, etc. The purpose of trace analysis is to identify the perpetrator of the crime and to collect evidence for presentation in court.

As part of trace analysis, forensic experts conduct many different tests and examinations. The most important of them are (Stojer-Polańska 2018):

1)   Fingerprints: Forensic experts compare fingerprints found at a crime scene with those of suspects. This comparison consists in evaluating the shape, size, fingerprints and other characteristics of the fingerprints. If the fingerprints found at the crime scene and the suspect's fingerprints are the same, then the suspect can be considered to have been present at the crime scene.
2)   Shoemarks: Forensic experts examine shoeprints left at a crime scene. These tests include evaluating the size and shape of the footprints, sole type, sole pattern, etc. Comparing the footprints found at the crime scene with the suspect's shoes can help determine if the suspect was present at the crime scene.
3)   DNA analysis: DNA analysis is the identification of DNA from biological samples such as blood, saliva, semen, etc. Comparing a suspect's DNA with DNA found at a crime scene can help identify the perpetrator of a crime or rule out innocent suspects (genetyczne.pl)
4)   Hair analysis: Forensic experts examine the hair found at a crime scene to determine color, length, texture, and other characteristics. Comparing the hair found at the crime scene with the suspect's hair can help determine whether

the suspect was present at the crime scene.

5) Instrument analysis: Forensic experts examine the murder weapon found at a crime scene to determine if it was used in a crime.

B. DNA analysis

DNA analysis is one of the most important and effective methods used in forensics. This method consists in analyzing the unique genetic code, which is DNA, in biological samples taken from the crime scene or from the suspect (Lebiedowicz 2022).

DNA analysis allows you to identify the perpetrator of the crime, as well as to exclude innocent suspects. This method can be used for various types of crime, such as murder, rape, theft, kidnapping, sexual crime and many others. The DNA analysis process begins with the collection of biological samples from a crime scene or suspect. These samples can be taken from various sources, such as blood, saliva, semen, hair, skin, nails, etc. (Lebiedowicz 2022). The collected samples are then processed to isolate the DNA. DNA analysis consists in comparing the DNA sequence from biological samples with the DNA sequence of the suspect (genetyczne.pl). This comparison is carried out using specialized tools, such as gel electrophoresis, PCR (polymerase chain reaction), DNA sequencing, etc. If the DNA sequence found at the crime scene or in the collected biological samples matches the DNA sequence of the suspect, then the suspect may be considered to have been present at the crime scene. DNA analysis can also provide other important information, such as the sex of the person who left the biological sample, as well as hereditary characteristics, such as eye color, hair color (genetyczne.pl). DNA analysis is one of the most effective methods of identifying the perpetrators of crimes and excluding innocent suspects (Szczepaniec 2013). This method is also very important in the case of research for the rehabilitation of wrongfully convicted persons. DNA analysis is therefore an extremely important tool in the fight against crime and ensuring justice in the legal system.

C. Ballistic analysis

Ballistic analysis is a method used in forensics to examine and identify firearms and ammunition used in a crime. This method consists in examining various characteristics of weapons and ammunition, such as caliber, cartridge type, degree of wear, shape and size of fragments, in order to determine whether a given weapon was used in a specific crime (Wrzesiński 2021).

Ballistic analysis is based on laboratory tests using specialized equipment and tools (Bogiel 2014). Various techniques are used for the research, such as comparative research, analysis of patterns and graphology, examination of bullet and shell marks, as well as examination of the outer layers of the bullet to determine which path it traveled. In comparative studies, researchers compare data from weapons found at a crime scene with data from weapons found in suspects or found elsewhere. In the case of pattern analysis and graphology, researchers compare the burning patterns of a firearm with those found at a crime scene to determine whether the weapon used in the crime was the same type as the firearm found elsewhere (Bogiel 2014). Laboratory tests as part of ballistic analysis are very accurate and precise, which allows you to reliably determine whether a given weapon was used in a specific crime (Hołyst 2021). Ballistic analysis is an important tool in the fight against firearms crime such as murder, robbery, assault and armed theft. This method helps in identifying the perpetrators of crimes and in ensuring the safety of society by eliminating dangerous people and weapons from the streets.

D. Document analysis

Document analysis is one of the tools used by forensic science to clarify the circumstances of a crime (Szator-Jaworska 2010). It consists in examining various types of documents, such as letters, invoices, contracts, certificates, identity cards and many others, in order to obtain information that may help identify the perpetrator or the course of events (Mróz-Jagiełło 2013).

Document analysis can include many different techniques and methods, such as handwriting examination, verification of the authenticity of documents, examination of fingerprints on documents, as well as analysis of the content of documents. For example, handwriting examination may involve comparing the handwriting found at the crime scene with the handwriting of the suspect to determine if it matches. Verification of the authenticity of documents may include checking whether the document has been signed by an authorized person or whether the signature has been forged. Document content analysis can also be very important in forensics. It consists in examining the content of documents in order to obtain information on events, people, places, times and other details related to the crime. For example, in the case of a letter, this may include analyzing the language, writing style, sentence structure, and other characteristics that may indicate the author's identity or intentions.

All of these techniques and methods of document analysis are used by forensic science to obtain as much information as possible that can help in investigating and solving criminal cases. However, to obtain reliable results, the analysis of documents must be carried out by specialists who have appropriate training and experience in this field.

E. Computer analysis

Computer analysis is one of the tools used by forensic science to clarify the circumstances of a crime. It involves the examination of various electronic forms, such as computers, telephones, hard drives, flash drives and many others, in order to obtain information that can help identify the perpetrator or the course of events. Computer analysis can include many different techniques and methods, such as data recovery, memory content analysis, file examination, file authenticity verification, digital trace examination, as well as analysis of the content of electronic communications. For example, data recovery may involve restoring deleted files or viewing the browsing history to find information about the suspect's activity. The study of digital traces is the process of examining

the remains of user activity in the IT system, such as system logs or traces of activity on the server. Analysis of the content of electronic communications may include examining emails, text messages, voice calls or chats to obtain information on events, people, places, times and other details related to the crime (Kasprzak 2015). All of these techniques and methods of computer analysis are used by forensic science to obtain as much information as possible that can help in investigating and solving criminal cases. However, to obtain reliable results, computer analysis must be carried out by specialists who have the appropriate training and experience in this field. In addition, in the case of analyzing electronic devices, it is important to maintain appropriate procedures, such as securing the device against further changes or saving a copy of data to avoid data loss.

F. Sound expertise

Sound expertise is one of the tools used by forensic science to determine the circumstances of a crime or event. It involves the analysis of sounds or sound recordings to identify speech, actions or other sounds that may be related to a given event or crime (abw.gov.pl). Examples of situations where sound expertise can be used by forensic science include recordings from wiretaps, conversations recorded by private persons, recordings from industrial cameras or recorders in cars. Sound expertise can be carried out in order to identify the person speaking on the recording, read the content of the conversation, determine the time and place of the recording, or identify the source of the sound. For this purpose, many different techniques are used, such as spectrogram analysis, frequency analysis, analysis of time parameters, or analysis of voice characteristics (Kozłowska 2010). Spectrogram analysis consists in examining the variability of the sound spectrum that appear during speaking. Frequency analysis identifies the sound source, such as a specific type of musical instrument or a specific type of weapon. The analysis of temporal parameters includes the study of the pace of speech, tonality or the length of pauses between words. The analysis of voice features consists in identifying features such as breathing pattern, voice frequency, intonation, way of speaking or accent. All of these audio analysis techniques and methods are used by forensic science to obtain as much information as possible that can help in investigating and solving criminal cases. However, to obtain reliable results, a sonic expertise should be carried out by a qualified professional who has the appropriate training and experience in the field.

G.Profiling

Criminal profiling is a research method used by forensic science, the purpose of which is to create a psychological and behavioral profile of the offender. Criminal profiling is aimed at determining what personality traits, lifestyle, preferences and habits the perpetrator has, as well as what were his motivations for committing the crime, what were the circumstances of the crime and what his goals (Gołębiewski 2008) were. Criminal profiling uses data from criminal investigations, analysis of evidence, witness statements, as well as information related to

the perpetrator's past, including his life, family and professional history, to create a psychological and behavioral portrait of the perpetrator of the crime (Drożdż 2020). Criminal profiling can be used to help identify the perpetrator, determine the motivation behind the crime, and assist in the investigation and capture of the perpetrator. Techniques used in criminal profiling include psychological and behavioral research, analysis of language and writing style, research related to the place and time of the crime, analysis of evidence and forensic clues, analysis of testimonies and interviews with the suspect's family and friends. An expert analyzing a criminal uses various tools and research techniques, such as the London method, the classical method, the method of David Canter and others (Canter&Youngs 2010).

Although crime analysis is considered one of the most effective research tools used in forensic science, it is not free from criticism. Some critics argue that crime analysis is subjective and depends on the skill and experience of the expert, which can lead to erroneous conclusions. For this reason, criminal analysis is used with caution and always in conjunction with other research methods.

III. CONCLUSION

In this work, forensic methods and techniques that are necessary in conducting effective investigations and identifying perpetrators of crimes have been characterized. Today, forensic science is a key area in the fight against crime and requires the use of specialist knowledge and scientific methods.

One of the key elements of forensic science are methods and techniques in the field of investigative and criminal psychology. Investigative psychology deals with the study of the behavior and actions of people in the context of criminal proceedings, which enables the collection and analysis of evidence and the identification of people associated with a crime. Criminal psychology, on the other hand, deals with the study of the psychological causes of crime and the analysis of the psychological profiles of criminals, which allows the development of crime prevention strategies and methods of dealing with criminals.

Other key areas of forensic science include forensic medicine, chemistry, physics and computer science. The methods and techniques in the field of dactyloscopy allow for the identification of people associated with a crime by examining fingerprints, while ballistics allows to determine what weapon the shots were fired from. Toxicology allows for the examination of the content of toxic substances in the bodies of crime victims, and forensic genetics allows for the identification of perpetrators on the basis of DNA tests.

It is worth noting that the effectiveness of the use of forensic methods and techniques depends on the appropriate knowledge and skills of specialists and on the availability of appropriate equipment and tools. Their use also requires compliance with appropriate procedures and standards to avoid false accusations and ensure the fairness and integrity of the proceedings.

Along with technological progress, forensic methods and techniques are also developing, which allows for more effective

investigations and identification of perpetrators of crimes. However, it should be remembered that technological development can also be used by criminals, which requires continuous improvement and improvement of forensic methods and techniques.

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