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**Scientific research and preservation of questioned documents and goods assessed in order to determine types of illegal activities occurring within intra and interstate borders**

Summary of the PhD Thesis

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In the extensive domain of forensic science, the scientific analysis of documents aims to provide information concerning the document itself, as well as the proper way to preserve in time valuable documents. This is done to assist experts uncovering potential evidence within the document and to place it before the courts. The assessment also identifies various detection and authentication technologies and tools that currently exist or are in development as counter measuring, providing some insight into ways of challenging or rebutting fake or altered content.

The current PhD thesis aims at researching the principle, methods and all main techniques used for document examination. According to the subject of examination it is divided into seven chapters, structured on two parts, namely theoretical part and the experimental one.

A most common, convenient definition of a “document” is a physical item that contains written or printed information normally made of paper, hybrid, or polymers.

The first part of thesis presents the theoretical information regarding documents, travel document and currency. This section provides introductory information and terminology about documents such as type of documents, examinations or the role of experts involved in document examination.

The second part of the thesis is dedicated to technical and practical aspects and includes topics related to technology and specialized examination of documents and currency. Examination of questioned documents include direct and comparative examination of all security features.

Addressing document fraud remains a high-priority risk factor demanding attention from all European nations. This phenomenon enables irregular migrants to deceitfully enter, pass through, or exit the territory of a single member state, granting them the ability to exploit the freedom of movement within the Schengen area. The fabrication of false identities poses a significant threat to national security and can lead to the improper utilization of social welfare benefits.

Moreover, document fraud serves as a conduit for criminal networks' members and their victims to move unrestrictedly across borders, aiding criminals maximizing profits by capitalizing on international trade differentials. Furthermore, fraudulent documents are a well-known tool exploited by terrorists, foreign fighters, and individuals of concern, who leverage them for deceptive border crossings within the European Union (EU). Various forms of cross-border crime, such as organized property theft, environmental crimes, and smuggling of illicit substances and firearms, also heavily rely on use of forged documents or currency. As the

landscape evolves, the emergence of more sophisticated modern documents and currency implies the utilization of advanced fraud techniques and substantial financial resources. This development likely strengthens the connections between organized crime and the suppliers of fraudulent documents. Fraudulent activities are carried out with the aim of deceiving, employing fictitious and misleading justifications that lead to the deliberate yet illicit transfer of assets, commodities, or an undeserved benefit to the perpetrators.

The scientific method of document examination is about studying these noticed phenomena and finding correlation between them.

Broadly speaking, document fraud encompasses a diverse array of documents including official records, travel or identification documents, currency, driver's licenses, stamps, privately signed documents, and other authoritative papers. Within this assortment of valuable documents, the most prevalent instances of forgery occur within travel documents, identity documents, and similar categories, in addition to currency.

Document fraud involves the production of false documents or currency as well as the utilization of authentic documents acquired through deceit, misrepresentation, or theft. These fraudulent documents can fall into several categories:

- Complete forged or counterfeits when whole new documents are crafted, often using alternative materials, with intent to closely mimic genuine documents.
- Partially forged (altered) documents, altered stolen documents (including blank ones). This involves the modification or addition of authentic documents issued by legitimate authorities. Altering a document involves making changes to its content, structure, or appearance or look, which may involve adding, removing, or modifying text, images, signatures, dates, or other elements.
- Pseudo documents are designed to appear genuine, often incorporating similar design elements, logos, and formats as real documents. However, they are produced without proper authorization or legal backing and are typically used for illicit purposes such as identity theft, fraud, or evading or avoiding legal requirements.

The act of falsifying or forging documents can vary, ranging from simple actions like removing or inserting pages and items (such as changing expire date or inserting a new picture) to employing chemical or mechanical alterations.

Commonly, individuals use computers equipped with scanners and printers to replicate the original security elements found in travel and identification documents. Additionally, forgers employ facial morphing technology to digitally blend the identity photographs of the legitimate document holder and a potential user, enabling a single document to be utilized by two individuals.

Document fraud plays a key role in facilitating a wide spectrum of criminal activities. This encompasses various forms of interstate crime like migrant smuggling, human trafficking, as well as the illicit trade of drugs and weapons. Additionally, document fraud can serve as a conduit for broader financial fraud, corruption, and acts of terrorism.

The prominence of document fraud is, partially, attributed to the fact that it doesn't necessarily demand intricate tools or substantial financial investments. While advanced technologies are occasionally employed, much of the fabrication can be accomplished using commonplace equipment such as computers, scanners, and printers.

The importance of knowing these forgeries is given by the fact that they are practiced not only on the territory of a single state, but on a global scale, the forgeries being used by organized crime groups in the commission of crimes that directly affect the security of the population.

Material deduced from a document by comparing it with another one or more other documents can provide invaluable evidence on which an expert can make a decision. In any other science there are areas of uncertainty, therefore the complete knowledge of any subject is unobtainable.

Printed documents frequently become entangled in criminal activities, and when suspicions arise regarding the authenticity of a document, forensic analysis becomes imperative to discern the methods and materials employed in its creation. It holds paramount significance to ascertain the substrate composition, printing technique employed - whether it's offset, letterpress, intaglio, inkjet, or toner - and the methods used to protect and safeguard the official documents.

Conducting such examinations necessitates a thorough comparison between legitimate or reference documents and the potentially forged ones. This involves scrutinizing the quality and methods of printing, along with the inks or security features utilized in safeguarding the document. In certain instances, it becomes crucial to establish whether a set of printed documents originates from the same source.

Furthermore, the examination must also establish whether the security attributes of the questioned document correspond or align to those of the authentic version and deduce the

means of reproduction or the original source document. To effectively extract pertinent evidence from the document under scrutiny, the expert must possess advanced comprehension of document substrates and printing methodologies.

Security printing techniques employed in documents and currency are primarily explored, encompassing both methods of recognition and prevalent strategies used by counterfeiters. The study also delves into specialized printing inks and their examination. Contrasting standard printing inks from those employed in safeguarding travel documents and currency – like colour-shifting, UV, or metamereric inks – can be achieved through non-destructive assessments involving reflectance or luminescence under various lighting conditions. Techniques such as mass spectroscopy or infrared absorption spectroscopy are also employed.

The document examiner is tasked with systematically applying non-destructive lighting methods, comparing the questioned document to an authentic or reference document. Although ink comparison can suggest a potential origin, it cannot definitively identify the source due to the non-uniqueness of inks to a single printing device.

Criminal networks are distinctly marked by their intention to operate across international boundaries, with certain criminal endeavours extending their influence globally. Specific areas exhibit attributes that favour serious and organized crime, both within the EU and on a broader scale. These locales serve as hubs for enabling individual or multiple criminal operations, often concurrently.

Strategic locations entice criminals due to factors like their geographical positioning, closeness to source nations, or affiliations with consumer markets.

However, in recent years, the landscape of document fraud has undergone a massive transformation. This is due to the incorporation of advanced security features in contemporary documents which are extremely hard to reproduce or alter. These include elements like laser-engraved polymer biodata pages, optically variable devices, intricate relief embossing, micro-laser perforations, and RFID chips containing original applicants' photos and fingerprints.

These sophisticated attributes make it as said significantly harder for forged or counterfeit documents to elude scrutiny during control procedures. They also substantially elevate the level of skill, expertise, technology, and equipment required to manufacture fraudulent documents, consequently driving up their overall cost. High-quality forgeries demand greater investment and are thus not readily accessible to all potential fraudsters.