



Emerging researcher article

The sharing of ballistics data across Europe and neighbouring territories



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ABSTRACT

The current study explored the use of ballistic examinations and cross-border information sharing across 14 European countries. The presented data were collected using a mixed methods technique consisting of semi-structured interviews and questionnaires that were completed by participants. The results painted a very heterogeneous picture of the use of automated ballistic systems across these countries, as well as how ballistic analyses are integrated in the fight against gun-enabled crime. Three super-ordinates themes emerged from the thematic analysis: use of automated ballistic systems; Ballistic evidence recovery and analysis; knowledge exchange and best practices. The ability to draw firm conclusions regarding the value of ballistics comparison systems, either on a national or cross-border basis, is hampered by inconsistencies regarding data recording practices and definitions. Therefore, key recommendations are suggested to establish better cross border cooperation between member states and develop a better understanding of data sharing procedures.

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1. Introduction

Previous research has illustrated the importance of sharing ballistic evidence across borders [1]. The use of automatic ballistic comparison systems is now commonplace within forensic labs, enabling quick comparison of recovered bullets and cartridge cases from crime scenes to a database. When analysing ballistics evidence, ballisticians must examine and compare the unique markings that are transferred onto the bullets and cartridge cases when fired from a firearm. This is known as 'rifling', in which unique lands and grooves are indented on the bullet as a result of traveling through the barrel of the gun. Additionally, markings and impressions can be made by the firing pin, breech face and ejector/extractor marks on the cartridge cases [2]. These markings provide essential evidence for linking bullet/cartridge cases to guns.

Further, experts are able to link firearms to crimes by comparing these unique markings. Therefore, many forensic institutes maintain what are known as open case files (OCF), where exhibits (i.e. bullets and cartridge cases) from unsolved crimes are stored [3]. Confiscated

guns can be test fired to compare the projectile with the OCF, as well as new evidence found on crime scenes, to find potential "links". The exhibits of an OCF are organised according to "class characteristics": *for bullets, these characteristics include the calibre, number, and direction of land impressions together with their width and pitch; for cartridge cases, characteristics include the calibre, shape of firing pin impression, breech face impression, and the position and shape of ejector and extractor marks* (pp238) [1]. However, figures reported on ballistic analyses and the prevalence of their use to combat GEC are missing.

The manual search using microscopes can be used in conjunction with automated systems to compare markings. As such, the use of automated ballistic comparison technology enables ballisticians to compare bullets/cartridge cases at a much faster rate and to combat gun crimes by linking firearms to crimes [4], known as hits. Ballistic automated comparison systems enable the conversion of spent cartridges and bullets in a two- or three-dimensional image that will be used to compare to other pieces of evidence recorded on the system. As such, correlation scores will be typically calculated for the firing pin impression, breech face, and ejector mark and ranked according to the most likely match on the system for cartridge cases to the least likely match. The most likely matches will be compared by ballistic examiners and confirmed in order to establish the presence of a hit [5]. Correlations are calculated using computer algorithms, in which images of ballistic material are compared the content of OCF to run a correlation process, leading to a "hit list" ranking potential matches to the item being considered. Therefore, the number of hits that were identified by each country concern cases in which a spent cartridge or a bullet retrieved in a criminal

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investigation were matched with an item stored in the OCF within the country. There are two types of hits: “warm” hits that are investigative or intelligence-led, whereby investigators indicate a probable connection; and “cold” hits, in which a link or identification is made when no previous intelligence existed [1]. De Ceuster et al. [1] noted that OCFs are of great value when finding “cold” hits. The process of double casting (making microscopic quality replicas from ballistic evidence), has also been used as an alternative to sending original evidence for the purpose of international comparison or linking previous crimes, as well as in situations whereby the ballistic systems used were not interoperable between the interested parties [11].

However, De Ceuster et al. [1] highlighted numerous limitations of ballistics comparison systems, such as: the limited capabilities of the correlation algorithms; the size of the database reducing the ‘hit’ rate as it increases, the creation of ‘noise’ by non-relevant evidence in large databases; the correlations influenced by factors such as the material in which the bullet or cartridge case was made or the presence of lacquer on the casing. Due to numerous limitations found with regard to the correlation efficiency, De Ceuster et al. [1] concluded that the use of cross-border sharing systems had little value at that time.

Despite the limitations raised by De Ceuster et al. [1], numerous advantages have also been shown, such as economic benefits and time efficiency with the possibility of a faster process of ballistics identification, and the reduction of backlogs and delays of these analyses, which in turn prevent further gun-enabled crimes [6,4,7]. Another argument favouring automated ballistic systems that is worth mentioning concerns the successful results that were obtained by the National Integrated Ballistic Information Network (NIBIN) in the USA. In 1999, in an attempt to improve the efficiency of ballistics imaging in the USA, as well as sharing ballistic intelligence between the different States, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and the Federal Bureau Agency (FBI) agreed on the implementation of a new system “NIBIN”, under the responsibility of the ATF. According to King, Wells, Katz, Maguire and Frank [5], NIBIN was considered an effective system, totalling over 47,000 ‘hits’ by 2012.

Automated ballistics systems are widely used across Europe. Several countries including the United Kingdom, Belgium, the Netherlands, Croatia and Kosovo³ have adopted the use of this technology, although the use of automatic ballistic comparison systems is not homogeneous, with different systems used in different countries such as PAPILLON Arsenal, Evofinder and the Integrated Ballistics Identification System (IBIS). These systems provide the possibility to compare evidence at a national level but also offer the possibility of comparing evidence at an international level where weapons appear to travel across countries. However, compatibility issues arise between systems due to the use of different file formats, which in turn render data sharing problematic [1].

The Interpol Ballistics Information Network (IBIN), founded in 2009, supports the cross-border exchange of ballistic data within the EU and beyond, for countries which are equipped with IBIS technology. However, non-IBIN member countries can also benefit from IBIN’s international ballistics database through Interpol, using evidence recovered from test fires or double-casting resin replicas (making copies of bullets/cartridge cases) that can then be entered on IBIS and compared with other IBN member countries (cf. Interpol website).

The transit of firearms and their use in individual and mass shooting incidents has increased the prioritisation of firearms trafficking investigations across Europe. This issue is even more pressing given the recent increase in shooting incidents across Europe, which has led to Europol placing the trafficking of firearms on the watch list of the Serious and Organised Crime Threat Assessment [8]. Consequently, it was essential to obtain an up to date picture of ballistics technology and information sharing across Europe in order to determine whether the conclusions

made by De Ceuster et al. [1] have been remedied by updates, or whether they are still applicable today.

Therefore, given the absence of research providing evaluations on cross-border facilitation of sharing ballistics data, this mixed-methods study aimed to provide a holistic exploration concerning the perceptions of first hand users on how ballistic analysis can help to fight against gun enabled crime (GEC) across Europe and gather qualitative data which has been neglected thus far. More specific objectives were to: (1) review the latest available figures for the number of ballistic evidence that were received in the labs, as well as submitted to the automated system within selected European countries; (2) identify the number of hits and to examine how ballistic data was shared across borders; (3) provide a detailed analysis of how ballistics intelligence is currently collated, used and shared between European Countries, Western Balkans and transnationally; (4) explore the perception of efficiency of ballistic comparison systems and whether ballistic intelligence provides evidence, that crime guns do travel across EU borders; and finally (5) identify areas of good practice for the ballistics procedure and to outline recommendations to improve such procedures. As such, a comprehensive study exploring the perceptions and understanding of core EU member states as well as select countries from Eastern Europe could be instrumental in strengthening protocols that are already implemented to share data throughout Europe. In addition, recommendations are needed in order to establish better cross border cooperation between member states and develop a better understanding of data sharing procedures, which should be implemented.

2. Method

The EU-funded project Examination of Firearms and Forensics in Europe and aCross Territories (EFFECT) [9] aimed to provide EU policy makers with a definitive body of knowledge concerning the nature, extent and impact of gun enabled crime (GEC), the effectiveness of interventions aimed at combating GEC and the cross-border sharing of ballistic intelligence. The overall project was divided into three strands: policy and legislation around firearms, policing gun crime, and ballistic analysis. This current study reports the findings from the latter strand, using mixed-methods consisting of the use of quantitative questionnaires (to fulfil objectives one and two), and semi-structured interviews (to address objectives three to five).

2.1. Research design

The design of the questionnaire drew together previous studies and other relevant literature exploring the potentiality of a European shared database [1]. It also reflected the methodology used in King et al. [5] in which they investigated homicide cases that were resolved using the NIBIN system. The questionnaire consisted of questions on the automated systems in use (if any) or alternative methods (e.g., double casting), the quantity of bullets and cartridge cases acquired and correlated in the system nationally, and the number of hits derived from the correlations, as well as the existence and use of a Service Level Agreement.

Information gathered from the semi-structured interviews will be focusing on the objectives set in the introduction on the topic of ballistic analysis to fight GEC. Interviews to ballistic experts aimed to collect more detailed data exploring the process of handling firearms, spent brass and fired bullets from crime scene, the challenges and the processes, the use of ballistics comparison system and automated system, international ballistics connection, recommendation on how gun crime could be prevented nationally and at international level.

All interviews (conducted with individuals or groups) followed an interview guide designed specifically for different stakeholder organisations (i.e. policy makers, police, ballistic experts, statisticians, members of non-governmental organisations). This ensured that the data generated were comparable and reliable.

³ All references to Kosovo are without prejudice to positions on status, and are in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

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