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Forensic intelligence framework—Part I: Induction of a transversal model by comparing illicit drugs and false identity documents monitoring

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ABSTRACT

Forensic intelligence is a distinct dimension of forensic science. Forensic intelligence processes have mostly been developed to address either a specific type of trace or a specific problem. Even though these empirical developments have led to successes, they are trace-specific in nature and contribute to the generation of silos which hamper the establishment of a more general and transversal model. Forensic intelligence has shown some important perspectives but more general developments are required to address persistent challenges. This will ensure the progress of the discipline as well as its widespread implementation in the future. This paper demonstrates that the description of forensic intelligence processes, their architectures, and the methods for building them can, at a certain level, be abstracted from the type of traces considered. A comparative analysis is made between two forensic intelligence approaches developed independently in Australia and in Europe regarding the monitoring of apparently very different kind of problems: illicit drugs and false identity documents. An inductive effort is pursued to identify similarities and to outline a general model. Besides breaking barriers between apparently separate fields of study in forensic science and intelligence, this transversal model would assist in defining forensic intelligence, its role and place in policing, and in identifying its contributions and limitations. The model will facilitate the paradigm shift from the current case-by-case reactive attitude towards a proactive approach by serving as a guideline for the use of forensic case data in an intelligence-led perspective. A follow-up article will specifically address issues related to comparison processes, decision points and organisational issues regarding forensic intelligence (part II).

1. Introduction

Forensic intelligence plays a new role in forensic science through its extension of its case-by-case approach into a more phenomenological and proactive approach [1–3]. This role is complementary to the traditional mission driven by the justice system [4]. Forensic intelligence is derived from traces[1] that when extracted, analysed and interpreted, generate timely knowledge aiming to support information processes and decision-making in policing and in the broader security context (e.g. strategic, operational and tactical levels) [4,6]. In the traditional evidential approach, the process is centred on the relationships between information gathered from cases and putative persons or objects (i.e. putative sources). In contrast, forensic intelligence focuses essentially on the criminal activity. Its role is not solely limited to investigations or to confirm hypotheses suggested by conventional police means, but also to proactively provide insights into criminal activity and to support the elicitation of relevant hypotheses.

The often repetitive and evolving nature of crime requires an organised and dynamic management of forensic case data that facilitates the connection of cases to each other. Forensic intelligence is based on the ability of traces to be measured,

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[1] In this paper, the term ‘trace’ is applied to any mark, material or remnant of an activity or presence. It is used independently from the actual size of this remnant [5].

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categorised, stored and compared systematically in a timely fashion [7]. For example, in the illicit drug[2] profiling area, forensic intelligence can be considered as "*a systematic process in which each new specimen is compared with existing data organised in a memory built upon earlier seizures or known origin references. It can then be interpreted in the context of the current understanding of the crime situation in order to obtain intelligence*" [4]. Forensic intelligence is critical to intelligence-led policing models as forensic science offers a source of accurate information based on objective, measurable and comparable entities. Steps and actions among the forensic intelligence processes are therefore amenable to formalisation and systematisation. Likewise, reliability and uncertainty can be modelled and then critically assessed at every stage, generating a controlled and transparent process. In combination with alternative traditional intelligence, forensic intelligence has the potential to address problems deemed to be complex due to their repetitive, evolving and pervasive nature or due to the involvement of organised crime. It also offers an alternative for understanding the criminal environment that may be difficult to infiltrate using traditional investigative means [8].

For about three decades, forensic intelligence applications have been increasingly developed in different fields of study of forensic science (e.g. [9–19]). These developments have mainly focused on specific traces or on specific problems with the view to define and overcome specific challenges. Impressive results were achieved in some instances, as those discussed in Refs. [9,11,17,20–25], for example. However, this narrow focus (i.e. trace- or problem-specific approach) also reinforces the current silos, which appears to be in contradiction with the generic essence of these developments. This situation inhibits cross-fertilisation between disciplines and prevents the emergence of a transversal understanding of forensic intelligence issues. Previous research addressing these issues on a more general level has identified recurrent and persistent difficulties, such as the general case-by-case approach used in police and forensic science departments; the partitioning of information and responsibilities among and across organisations; the lack of codification and systematisation in data management; and the difficulties related to information that is inherently incomplete and uncertain [3,7,9,14,16,22,26,27]. However, despite these generalisation efforts, the full potential of forensic intelligence has yet to be realised. Indeed, this role of forensic scientists is still sidelined. The application of forensic intelligence and the added value obtained are yet to be widely recognised. Furthermore, while intelligence-led policing approaches are starting to be accepted and well-established worldwide, further work is required to clarify their connection with forensic science.

With the view to contribute to fill these gaps, this article introduces a general and multi-commodity model that could guide the use of any forensic case data in an intelligence-led perspective. It aims to illustrate the benefit of building generic frameworks for forensic intelligence and the conceptual feasibility of the approach. This development is demonstrated through the comparative analysis of two forensic intelligence approaches developed independently in Australia and in Europe (France and Switzerland) regarding the monitoring of very different problems: illicit drug seizures and false identity documents. This article combines results obtained in different countries and represents a sound starting point to consider future cross-border collaborations to tackle the challenges posed by transnational organised crime [28]. Forensic scientists are bound to play an essential role in this development since the entire forensic intelligence process starts with the trace, the fundamental object of study of forensic science [10].

[2] Narcotics, psychotropic substances and precursors under international control are called "drugs" or "illicit drugs" throughout this paper.

2. Rationale and method

The catalyst of this initiative was the incidental observation of strong analogies between two approaches being developed independently in different institutions, contexts, continents (i.e. Oceania and Europe), and related to two very different and distant types of traces (in the traditional forensic view), namely illicit drug seizures and false identity documents. Both projects already relied on several existing works in forensic intelligence [9,11,27,29]. However, it was realised that analogies at the core of the reusability of previous studies and the possibility of building common frameworks had not been explicitly explored.

Using descriptions of the respective approaches, the construction of a general forensic intelligence process was proposed through an inductive effort based on the comparative analysis of concepts and methods used in both projects. Further work exposed in a follow-up article will specifically address issues related to comparison processes/metrics, decision points and organisational issues (part II).

2.1. Descriptions of the forensic intelligence approaches

As a starting point, the key elements of the two frameworks (i.e. illicit drug seizures and false identity documents) are presented to highlight similarities and identify specificities. These approaches have been described extensively and validated for application to illicit drug seized in Australia [4,30] and false identity documents seized in France and Switzerland [31,32].

2.1.1. Illicit drug profiling

In Australia, law enforcement is shared by state and territory police forces and the Australian Federal Police (AFP). Different methods are thus utilised and the whole process is dependent on the organisation, its objectives and constraints. The process described in this section is the one followed by the AFP, the organisation that mainly handles illicit drugs seized at the border. When a seizure is made, an analysis is required to formally establish that the material is an illegal product (i.e. traditional forensic process aiming at establishing the type of illicit drug and the purity). This analysis also acknowledges that the seizure is an object of interest in a forensic intelligence perspective. Circumstantial and traditional information about the seizure is recorded during that phase and helps determine the "quality" of the seizure. Indeed, seizures must be comparable (i.e. substances that do not contain illicit drug but were presumptively tested as illicit drugs should not be included) to be introduced into the forensic intelligence process. Once the material has been established as an object of interest, samples that are representative of the whole seizure are collected and analysed. Measurable features (e.g. size, weight, colour, logo, organic and inorganic impurities, adulterants, diluents, etc.) are extracted and overall constitute a profile. These features are characteristics of the sample and are specifically chosen to obtain indications on the production and distribution processes, and the size and evolution of the illicit drug market. Ideally, the profiles should then be integrated in a memory (i.e. the core part of the database) and compared to all other profiles present in the memory. The comparison procedure is performed using a specific metric previously chosen and optimised [29,30]. The degree of relationship between the profiles is returned as a score (e.g. Pearson correlation or cosine function coefficient), providing the closeness between two profiles. This score is then interpreted and ultimately expressed in terms of the presence of a link. For example, Morelato et al. used a binary classification to determine the existence of a link between samples [30]. In this case, a link is either existent or non-existent according to a threshold value previously determined using a reference population. A continuous approach using likelihood ratios is currently being developed as