

**The potential of using the forensic profiles of Australian fraudulent identity documents
to assist intelligence-led policing**

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The potential of using the forensic profiles of Australian fraudulent identity documents to assist in intelligence-led policing

The manufacture and distribution of fraudulent identity documents (IDs) is a pervasive and prolific crime problem, enabling the activities of organised crime networks and terrorist cells. As reactive policing methods are ill-equipped to handle the transversal and repetitive nature of document fraud, in 2012 Baechler et al. suggested a complementary method that uses the systematic profiling and comparison of fraudulent IDs to identify those produced by the same source. While this method has been successful in Europe, it is yet to be implemented worldwide, and there is currently little known about the Australian fraudulent document climate. In this pilot study, 43 fraudulent IDs from Sydney-based New South Wales police stations were examined. Adapting the method used in Europe, these documents were imaged, and their visual characteristics were extracted before being organised into an excel database and manually compared. The characteristics chosen are fundamentally linked to the manufacturing process, including the printing methods and replication of security features. Of the documents examined 88% were linked to at least one other document, and five series emerged. These results suggest that the Australian document market may be structured, and that there may be prolific offenders operating at its core, much like in Europe.

Keywords: fraudulent document; organised crime; terrorism; forensic profiling,
forensic intelligence; identity crime

Introduction

The 1970's and 80's saw a dramatic increase in the number of recorded crimes ^{1, 2}, at a time when security and policing organisations experienced noted decreases in funding. Thus prompting the investigation into more cost-effective, efficient and complementary policing methods ¹, such as intelligence-led policing, of which forensic intelligence is a crucial aspect.

Traditionally, the main function of forensic science has been to solve cases within the judicial system, largely through identifying the relationships between traces and their putative sources. While forensic intelligence, at its core, still relies on the examination of traces, it shifts the focus from identifying the source of the trace, to instead using it to assist in understanding the criminal activity itself³. Through the implementation of the intelligence cycle^{4, 5}, information extracted from cases and their associated traces can give insight into the criminal environment. This method, which is complementary to traditional reactive policing methods, allows the simultaneous resolution of cases while also providing information to assist in the reduction, prevention, and disruption of criminal activities.

Crime is repetitive in nature, both in offenders, victims, and location (also known as hot spots)^{3, 6-8}. This repetitive criminality is what enables forensic intelligence to analyse past behaviour and instances of crime to help understand and disrupt future iterations of the criminal behaviour. Previous research has indicated that identity document fraud (being the manufacture, distribution and use of fraudulent identity documents and information) is characterised by a high degree of recidivism^{9, 10}. It is easy to see why these documents are such common targets of the criminal element, given that they play pivotal roles in movement across borders, access to government benefits, security and housing¹¹. Naturally, these benefits are one of the primary reasons why the manufacture, distribution and use of fraudulent identity documents is considered a “crosscutting criminal threat [that] enables and facilitates most, if not all, other types of serious and organised crime”¹².

Despite the repetitive nature of document fraud and its identified links to organised crime networks^{9, 10, 13}, the use of forensic intelligence within the field of document examination is routinely overshadowed by the authentication and detection paradigm and handwriting examinations¹⁴. While effective at identifying singular instances of forgery, this reactive focus, when used in isolation, has a limited effect on understanding and reducing the overall crime

rate ^{9, 15, 16}. The main disadvantage of these methods is that the focus is on the document as an isolated piece of information, and on the holder of the document, rather than on gaining an understanding of the methods, location, or identity of the manufacturer and distributor ^{9, 10}.

To fill this operational gap, inaugural work by Baechler et al. (2012) proposed the use of a systematic forensic intelligence method for the examination, profiling and comparison of the visual characteristics of fraudulent identity documents ⁹. In this work, it was postulated that the visual characteristics of these documents (e.g. printing methods used, replication of security features) are traces that are left behind during the manufacturing process ⁹. Therefore, these characteristics could be combined into profiles and then compared, enabling the detection of links between documents that could suggest the presence of a similar manufacturing method, and therefore a common source (i.e. the same forger, forgery factory or criminal network).

Despite the benefits of the work conducted by Baechler et al., the method has so far only been utilised within Europe and on fraudulent documents seized in Europe ^{10, 13, 17}, begging the question of whether such successes are anomalous to this part of the world. Interestingly, within the online market, fraudulent Australian identity documents are some of the most common products for sale, alongside European and North American documents ¹¹. Despite the strong presence of Australian documents within this marketplace and the ever-increasing rate of identity crime ¹⁸, the true nature and extent of document fraud within Australia is still underexplored. This gap in knowledge has been attributed to consistent under-reporting, the failure to detect and the many variable definitions of identity crime ¹⁸.

The purpose of this pilot study is to analyse the current criminal environment relating to document fraud in Australia and identify if there is any organisation behind the manufacture, distribution and/or use of fraudulent identity documents, and if the market is punctuated by prolific and organised offenders like those in Europe. This work is necessary to assess the

potential of implementing a systematic document profiling and comparison method within Australia.

Materials and methods

Dataset

In this study, 43 fraudulent identity documents were collected from Sydney based New South Wales (NSW, Australia) police stations in Chatswood, Eastern Beaches, Surry Hills, and Leichhardt police area commands. Within this set of 43 documents were mostly NSW driver licences and some other miscellaneous ‘identity’ documents, with a smaller number of Western Australian driver licences. There was also a mixture of counterfeit and pseudo documents¹. The complete data set along with their seizure locations are presented in Table 1. These documents were seized across an unknown period and the exact location of the seizure is unknown. Given the age bracket the users are claiming to belong to (18-25), a possible hypothesis is that some of these documents were used to gain access to or purchase alcohol from a licenced venue. However, it should be noted that the Australian Bureau of Statistics identified that 14.2% of offenders in Australia are between the ages of 20-24, with 15-29 years olds making up 42.4% of the offenders in the 2020-21 financial year¹⁹. So, the purchase of alcohol is just one possible hypothesis. In NSW, it is common for licenced venues to seize fraudulent identity documents from patrons and then surrender them to local NSWPF stations or officers during routine licencing checks (verbal communication from local Constable, Leichhardt Police Area

¹ Pseudo documents are those not officially recognised by any authority, for example, a document from a fictitious country, or a fictitious document type from a legitimate country. Counterfeit documents are those that have been entirely produced by a forger with the aim of imitating an existing official document.

Command; unreferenced, see ‘Acknowledgements’). Therefore, the only location information known is the station or police area command where the document was surrendered. While the lack of specific locations of seizure means that any spatial or temporal analysis on the documents will be limited, the aim of this study is to gain an understanding of whether there is any organisation behind the fraudulent document market in NSW, Australia, and if there are any prolific offenders present.

Forensic profiling method

All 43 fraudulent documents were examined with readily available, standard equipment used widely within the field of document examination ²⁰. Each document was examined with white light and an Ultra-violet (UV) light source before being photographed and scanned at 600dpi using a CanoScan LiDE 400 flatbed scanner and a background canvas, to normalise the colours. Per ethics approval (Approval: ETH204695), personal information was then irreversibly redacted from the documents to protect the identity of the user.

Table 1. Specimen information

Type of document	Type of fraud	Location of surrender	Nb. Documents
NSW Provisional Licence	Counterfeit	Surry Hills	17
		Chatswood	1
		Eastern Beaches	8
Total			26
	Counterfeit	Chatswood	10

WA Driver Licence		Eastern	3
		Beaches	
Total			13
NSW Student Identification	Pseudo document	Chatswood	1
		Leichhardt	1
NSW Proof of Age card	Pseudo document	Surry Hills	2
Total			4

Once the documents were digitised, they were then examined to extract visual characteristics of interest, which previous research has indicated are sufficient for profiling, while also being accessible and examinable by anyone ^{9,10}. All characteristics selected were those that are intrinsically linked to the method of manufacture of the document, such as the printing methods used, errors in the formatting and content and the replication of security features (UV features, microprinting, official logos etc.). In this study, ten characteristics were selected to form the document profile. Some features used in the profile are those that are used to authenticate identity documents, so exhaustive lists and descriptions of all features cannot be included.

Table 2: Example document profile

Characteristic type	Profile
Verification number	2345678
Licence number	98765432
UV feature	COA2

State badge	SB4
Errors	BE5
Printing method	Inkjet

Once the visual characteristics were extracted, they were codified to form the profile of the document and then they were manually compared across the data set. An example profile is provided in Table 2. Manual comparisons were determined to be the most appropriate method of comparing the profiles due to the relatively small size of the data set. A comparison metric model, which has been used in previous research^{9,10}, would not have suited as the current data set is too small to train the model. IBM i2 Analyst notebook (version 9.2) was then used to visualise any relationships that were found between the documents.

Results and discussion

Counterfeit NSW driver licences

Manual comparisons of the document profiles resulted in 21 of the 26 counterfeit NSW driver licences (80.1%) being linked to at least one other document, and four series emerged (a series being a group of documents that have a common source according to forensic profiling). The degree of similarity, calculated as a percentage of correlating characteristics (e.g., 7/10 = 70% similarity), was found to range from 50% to 100% within the identified series (Table 3). It should be noted that while some documents may not be fully alike, their similarity is identified using features that are so specific to the manufacturing process and source that a similarity of 70% or even 50% cannot be explained by any other hypothesis, other than the documents originating from the same source.

Table 3. Classes identified within the counterfeit NSW document set, the number of documents in each and the similarity range

Series identifier	Nb. of documents	% Similarity range
1	9	60-100
2	8	60-90
3	3	50-70
4	2	70

Within this data set, two relatively large series were detected, one of nine documents and one of eight, covering 35% and 31% of the NSW licence data set, respectively. While these documents were originally each treated as isolated instances of document fraud, from their degree of similarity it can be inferred that the documents in each series were manufactured using the same or similar methods, and that they therefore likely originated from the same source. Furthermore, this suggests that much like that in Europe, the Australian fraudulent document market may be characterised by prolific offenders ^{9, 10}. While admittedly the examined data set is small and restricted in scope (as they were all collected within a relatively small area), the number of links between these documents show the potential for a systematic document profiling and comparison method within New South Wales and potentially Australia. This is further emphasised by the cross-jurisdictional links found in Series 2 with links appearing between documents found in two separate area commands, Surry Hills, and the Eastern Beaches.

Figure 1 illustrates the size of each of the classes found, along with the jurisdictional overlap presented in series 2.

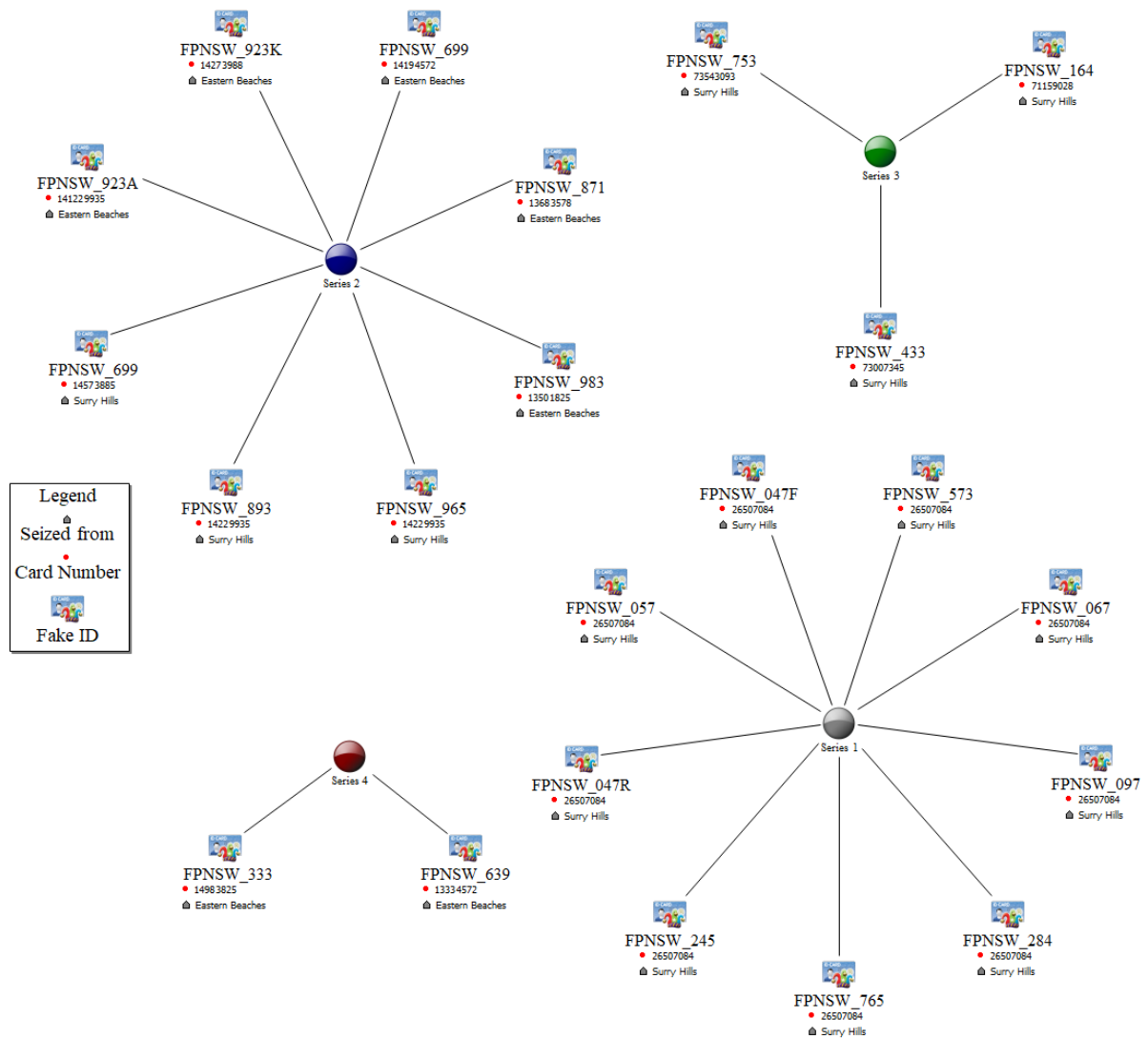


Figure 1. Diagram illustrating the links and size of the series identified within the counterfeit NSW licences. Created using IBM i2 Analyst notebook (version 9.2), this image is the property of the author.

Pseudo-documents – NSW proof of age and student identification cards

Four documents within the current data set were identified as pseudo documents. While manufactured to look like a non-restricted NSW driver licence, an NSW ‘Student identification’ is not officially recognised as an identity document. Two of these ‘Student Identification’ cards were present in the current data set, one was seized in Leichhardt and the other in Chatswood

(Figure 2). Aside from the visual similarities between the documents, including the use of the same hologram, the most telling characteristic that showed they originate from the same source was that they shared the same card number and identification number.



Figure 2. Side by side comparison of the two NSW Student Identification cards seized. This image is the property of the author.



Figure 3. Side by side comparison of the two NSW Age Proof Cards seized. This image is the property of the author.

The other two pseudo documents within the data set, the ‘NSW Age Proof Cards’, were both visually similar and shared the same document number (Figure 3). Interestingly, one of the age proof cards (left) shares the same hologram as the student identification cards above. It is possible that these documents originated from the same source, or alternatively that a larger

manufacturer is supplying spare parts of security features or blank templates that are being personalised by smaller vendors.

Pseudo documents are often marketed as ‘novelty items’²¹ and are often available on the open web, so a cursory search was conducted to investigate potential sources of these documents. Similarities were found between the seized documents and those for sale from a common ‘novelty’ fake ID vendor. This vendor had previously been the subject of an investigation, as reported by the Sydney Morning Herald in 2013²², and within that article two more examples of the age proof cards were found. Both of which shared the same document number as those presented above, indicating the source is probably the same. This illustrates how forensic profiling of fraudulent identity documents may connect seizures in the real world and fraudulent documents advertised over the Internet. This is another instance where having a greater understanding of the context around the seizure of these documents (e.g. the date) would help in understanding changes in the source materials and methods, and would provide greater intelligence regarding their manufacture and distribution.

Western Australian licences

A similar level of success was noted with the Western Australian (WA) driver licences, with all thirteen of the documents being linked to at least one other document. Initially, two series were found within the WA licences. The first examined set was made up of nine documents that all had the same serial number (D219 set). These documents also shared the same style of microprinting and a repeated error on the front of the document. The remaining four documents also shared a common serial number (D041 set), and a unique microprinting style.

However, when looking at other characteristics on the documents a great deal of overlap became obvious, along with some inconsistencies within the sets. These inconsistencies ranged from all thirteen documents having the same error on the back of the licences, to one of the D041 documents having the repeated error present within all the D219 documents. Without any

clear delineation between document sets, and with a range of overlapping characteristics, it is hypothesised that these two document sets could be part of the same series that has developed over time. Once again, a greater understanding of the context around the seizure of these documents would be relevant to assess this hypothesis.

Performance of the characteristics of interest

As recommended by Baechler et al. 2015²³, the performance of the chosen features forming the profile were examined against a selection criteria. These criteria examined the intrinsic and extrinsic properties of the features, with intrinsic criteria being those that depend on the feature itself while extrinsic are those that are more related to the measurement or observation methods used²³. Given the number of criteria, it is difficult in practice to satisfy all of them, instead a balance should be struck between intrinsic and extrinsic criteria.

For brevity, only a few criteria are explained and the performance of one feature, the state badge, is examined in Table 4.

Table 4. Description of the criteria developed by Baechler et al.²³ and the performance of the state badge of counterfeit NSW driver licences against them.

Criteria	Description	Performance of state badge (NSW Licences)
Intrinsic Criteria		
Low intra-variability	No or low amount of variation within a group of traces from the same source	Very little to no intra-variability within the series. One exception being one series which contained two distinct styles. These documents still grouped based on the other characteristics, highlighting the benefits of the multi-dimensional (multi-feature) profiling approach ¹⁰ .
High inter-variability	Significant variation among traces of different source	Each series was identified as having its own state badge classification, and there was no overlap between series.
Complementarity	The features must be as independent as possible	The style of state badge used doesn't dictate the presence, absence, or style of any other feature.
Representativeness	Reflects the features/characteristics of the source(s)/activity(ies) used to create the document	If the state badge/magnetic strip is bought from an external source then applied, this reflects the materials used in the manufacture. If it is made on site, it is representative of the stamp/template used by the source.

Extrinsic Criteria		
Low resource requirement	Low requirements for time, cost, equipment, knowledge, and training	The characteristic can be observed with the naked eye and require no special equipment.
Accessibility	Equipment and knowledge required to extract/identify the feature readily available, and the trace is readily available to extract with the correct equipment and knowledge	Visual characteristics are highly accessible and no special training is required to identify the differences between classes. A classification guide that is regularly updated, however, would increase the accessibility as well as the reproducibility and reliability.
Non-destructiveness	Does not alter or destroy the trace	The characteristic requires no treatment or alteration of the trace.

Limitations of sample set and future directions

In practice, the forensic intelligence process operates on three distinct levels:

- (1) Surface or strategic level (general considerations and trends)
- (2) Modus operandi level (identification of profiles and classes)
- (3) Series level (specific set of cases)

However, the ability to perform on these distinct levels is based on a few criteria; the size of the data sets, the contextual information around the specimens (e.g. seizure information), and the intelligence products desired^{9, 24}. To provide a general overview of the problem, being the

manufacture, distribution and use of fraudulent documents in Australia, a much larger data set with contextual information is needed. The noted absence of this information from this data set, in combination with the small size means that analyses are limited to the modus operandi and series levels.

One of the main functions of the second level is to differentiate organised criminal activities from isolated cases⁹. While the grouping of the documents suggest that they are not isolated cases, no definitive information about the structure of Australia criminal networks can be derived from the results. While it appears that the licences may be being used to access alcohol by underage individuals (claiming to be in the 18-25 age bracket), there may be alternative hypotheses as most criminal offences in Australia are being committed by individuals between the ages of 20-24¹⁹. Considering this, it is unsurprising that the data set is composed largely of documents that are being used by this demographic.

Future Directions

The best way to accurately assess the connections between document fraud, prolific offenders and organised crime is to continue expanding the data set, not just in numbers but also gaining access to a more comprehensive data set, including documents from a range of demographics and crime areas. As the data set expands, it will become possible to assess whether the Australian fraudulent document market is organised. In addition, the comparison process could be made more systematic, providing similarity scores that can be compared more objectively between the documents.

The data set presented here is composed entirely of credit card style identity documents, however, European studies have successfully applied this method to passports as well as paper style identity documents and driver licences^{9, 10, 13}. In expanding the data set, it would be informative to assess its performance against a broader range of identity credentials, such as passports, but also expanding to other document types of interest to policing agencies, such as

fraudulent licence plates along with other common, but less secure Australian documents such as Medicare cards and credit cards. These documents are often used in Australia to gain access to more secure, higher value documents, and these gateway documents are often found for sale on the Dark web as part of a “100 point pack”¹⁸.

Conclusion

A high proportion of the documents examined (88%) were linked on the sole base of forensic profiling, which alludes to the activity of prolific offenders and a potentially high degree of organisation of the document fraud market, much like in Europe^{9,10,13}. By identifying further related documents within larger datasets, forensic profiling may reveal organised criminal enterprises. As shown by our results, the profiling method is capable of highlighting links and series at the cross-jurisdictional level. It also enables the connection of investigations in the real world with fraudulent documents advertised over the Internet.

These preliminary but promising results illustrate the potential for an Australian systematic forensic intelligence model for the comparison of fraudulent identity documents. If used in conjunction with current, reactive policing methods this could provide insight into numerous criminal environments and shed further light on the organisation and extent of organised crime in Australia. The results from this work, while preliminary, illustrate that there is an abundance of information that can be extracted from these documents, information that thus far seems to have been underutilised within Australia.

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Declaration of interest statement

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Figure captions

Figure 1. Diagram illustrating the links and size of the series identified within the counterfeit NSW licences. Created using IBM i2 Analyst notebook (version 9.2), this image is the property of the author.

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