

## Digital transformations and the viability of forensic science laboratories: crisis-opportunity through decentralisation

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Rapid proliferation of technology in modern society is changing the way people behave and is dramatically increasing the traceability of individuals. In particular, new portable and miniaturized technologies put powerful capabilities in everyone's pocket, and capture a large quantities of detailed information in a digital format. These technological advances are undermining the traditional business model of forensic science laboratories by placing forensic capabilities directly in the hands of police. Simultaneously, these advances create new opportunities for laboratories to harness the power of big data and play a more central role in problem solving collaboratively with the police and other stakeholders.

### **Resistance is futile – embrace the change**

The forces driving decentralisation of forensic capabilities are irresistible, and will continue to grow in the future, particularly for digital traces. This is also true for many traditional forensic activities. Inevitably, problems are arising when non-scientists apply forensic capabilities that they do not fully understand, resulting in mistakes and missed opportunities. A subtler problem is that diffusion of forensic expertise makes it more difficult for individuals to learn about existing solutions to problems they encounter. Ultimately, individual investigators cannot cope with the growing quantities of data, rapid advances in technology, and varied contexts and criminal behaviours.

Forensic science laboratories have the opportunity (and dare we say duty) to mitigate these problems by embracing the decentralisation movement. Laboratories can accomplish this by forming a forensic ecosystem to amplify decentralised forensic capabilities, stream data from distributed sources into data lakes for big data analysis, and systematically distil and circulate knowledge throughout the decentralised forensic ecosystem.

## **Avoiding Kodak syndrome – digital transformation**

The Eastman Kodak Company faced similar challenges, struggling to adapt to the decentralisation of multimedia-making equipment and self-produced digital photographs and videos. Kodak was the historical global market leader, but, in the transition to digital photography, failed to transform its processes based on the centralization of its laboratory. The company ultimately filed for bankruptcy in 2012, and has continued to decline despite various efforts to restructure its business. This Kodak syndrome illustrates why what are called “digital transformations” are now essential to the viability of an organization.

To avoid the Kodak syndrome, a forensic science laboratory must undergo a digital transformation, changing its processes and culture to reinforce decentralised forensic capabilities and cultivate big data analysis as a core function, expanding its view of forensic science beyond the courtroom to advance problem-oriented and intelligence-led strategies.

Forensic science laboratories, which have focused on technologies centrally and routinely operated by technicians, are in great trouble. Many routine activities are being relatively easily transferred to local personnel while remaining compliant with quality assurance frameworks, effectively eliminating laboratories as the middle man. It is argued that the laboratories which are better able to adapt and survive are those with a stronger focus on their forensic role based on the knowledge gained through research and collaborative work with the police and the justice system. Laboratories must adapt to this decentralisation movement, integrating in their model the loss of their monopoly over the use of certain technologies, and providing knowledge on how to apply them adequately in a decentralised way. Furthermore, laboratories should strengthen their role in the forensic ecosystem by keeping a global vision of the growing amount of data produced by decentralised devices in their daily use.

The implementation of a two-way transfer of information and knowledge (from the field to the laboratory and from the laboratory to the field), as well as the development of big data processing and interpretation capacity, are key aspects of the needed digital transformation.

## **Forward leaning laboratories**

Beyond the development of knowledge to help solve complex cases, laboratories have the opportunity (and dare we say duty) to play a central role in moving towards a more proactive and strategic approach to dealing with crime in modern society.

By keeping a global view and extracting solid knowledge from the particular situations investigated, laboratories can be at the forefront of discovering crime patterns and reducing linkage blindness. This forward leaning posture requires laboratories to support much more centrally a wide variety of decision making processes contributing directly to abating crime, strengthening security, and reinforcing the criminal justice system.

This strategy is already relevant for many traditional forms of crimes. This becomes much more important because of the amplification of the strong serial nature of crimes perpetrated in digital environments.

Many research and operational projects already illustrate the concept. They are linked to areas as diverse as high volume crimes (Rossy *et al.* 2013), illicit markets (illicit drugs, counterfeit materials) and false ID documents (Baechler *et al.* 2015), as well as internet and computer-related crimes (Pineau *et al.* 2016) .

However, there is still a long way to go until this extraordinary potential can be more generally exploited. Laboratory managers and policymakers are still mainly focused on quality management of existing processes. The debate around digital transformations in forensic science remains weak. We encourage relevant communities to look beyond the court process and adopt a proactive attitude in face of the rapidly coming changes. By doing so, they will quickly realise that forensic scientists need to be reintroduced, from the crime scene to the laboratory, to value forensic knowledge and intelligence, and reinforce the use of decentralised technology and big data analysis. In doing so, they will support the development of broader strategies to deal with crime and security in a globalized, digitized and rapidly changing society. These broader strategies will further the objectives of governments that have recognized the need for systematic solutions to modern societal problems of crime and security.

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