University of Portsmouth Forensic Innovation Centre – Written evidence (FRS0058)

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Introduction
The Forensic Innovation Centre (FIC) at the University of Portsmouth takes a collaborative approach to forensic science and cybercrime learning, innovation and research. Through partnership with Hampshire Constabulary Scientific Services, the FIC is at the forefront of industry changes influencing and impacting on operational practice. The collaboration releases an increased capacity and availability of applied research for practice, provides the opportunity to develop and test new methods, and consolidates student learning and understanding of policing, forensic science and investigation processes.

The FIC researchers and police scientific service representatives have prepared a response to the inquiry. Our response is focused on our experiences working in the sector and it is aligned to the key strategic aims of the centre and individual areas of research and operational specialisms. Forensic science has a huge potential to contribute to the delivery of justice in the UK. In recent years there has been an increased drive towards a collaborative approach to research between academia and practitioners, and, an increase in the potential to directly impact practice. However, forensic science is still lacking in terms of a comprehensive evidence base in relation to the optimisation of applied forensic methods, techniques, and associated human factors.

In some respects, forensic science development is caught in a ‘perfect storm’ of infrastructural change through accreditation and improved competency standards, increasing pressures on police organisations, financial cutbacks, and depleted or exhausted resources responding to increasing complexities in their day-to-day operations. There needs to be a synergy between operational requirement and the researcher, ensuring that research is innovative and interdisciplinary, but also relevant for application in the field. Operationally the communication of forensic findings needs to be clearer to ensure that investigators are aware of the meaning, the potential, and the limitations of the evidence. However, the furthering complexities and stress placed on the system, as it stands, makes integration of new methods and techniques a great challenge. We outline our response to each question based on the experiences of our researchers, many of whom are practitioners, and our work with forensic bodies and police organisations in the UK.

Question 2: What are the current strengths and weaknesses of forensic science in support of justice?
The current strengths of forensic science in support of justice are:

- The potential to provide a scientific forensic reconstruction based upon empirical evidence
- A current drive towards an increased focus on quality, value and efficiency (regulation and accreditation, recognition of cognitive bias within case work, the Home Office biometrics project and Transforming Forensics programme)
• An increased openness to collaboration and partnership working between academia and practice leading to an increase in an evidence based approach to forensic practice
• Passionate individuals and organisations driving progression in research and change in practice.

Key limitations in terms of the contribution of forensic science to justice include:
• A growing general lack of national cohesion, guidance, coordination and a disparity in delivery. This is generally relevant across the sector, but clearly manifest in the interpretation of the quality frameworks and their delivery, despite many strategic groups, boards and initiatives.
• The lack of a comprehensive evidence base in relation to forensic traces (for example transfer and persistence) and the processes and techniques used to analyse these traces
• A limited appreciation of the role of ergonomic and human factors in forensic processes
• A lack of an appreciation of (and research supporting) the role of interpretation within some forensic domains (for example firearms and fire investigation)
• Operational financial limitations leading to a ‘select the best’ approach to forensic evidence gathering and analysis leading to only a partial forensic reconstruction
• A reliance on streamlined forensic reporting (limiting value and transparency)
• A lack of a joined up approach and information sharing between key stakeholders within the forensic process
• A lack of understanding and appropriate use of forensic evidence within the criminal justice system
• A lack of dedicated funding streams creating a disparity between operationally focussed and blue-skies research; both elements are required, and both must be funded.
• The low priority of research activities within operational practice (often driven by resource limitations) and a resistance to, or difficulties implementing change within frontline practice, resulting in a lack of an evidence based approach to strategic direction within forensic science

**Question 3** What is the scientific evidence base for the use of forensic techniques in the investigation and prosecution of crimes? Are there any gaps in that evidence base?

There is an increasing evidence base for the use of forensic techniques, however, there are many gaps and much of the existing evidence base is out-of-date with requirement. The integration of novel methods, even if they afford increased effectiveness and efficiency, is often constrained by unsuitable infrastructures that are incompatible with modern systems and technology. To ensure the reliability and value of forensic evidence, the evidence base needs to cover the dynamics of the forensic evidence itself; enable the furtherment of capabilities in terms of techniques to detect, analyse and interpret evidence; and, provide for better integration of people and processes with novel techniques and evidence. More specifically key gaps include:
• The evidence base needs to account for the integration of a new method into existing systems. Often good ideas are impeded by incompatibility, a lack of capacity to work to integrate new methods, and / or do not
consider how change to one aspect of a process impacts on other areas. Therefore, a systems-level review of the specific requirement and the existing system must be used to help integrate new methods efficiently providing best value

- A comprehensive understanding of human factors and ergonomics from crime scene to court is required to better integrate and align the many changes taking place
- There is a lack of an evidence base to support increased efficiency in practice
- Trace evidence dynamics (including GSR and firearms, as an example)
- Benefitting from interdisciplinary ‘blue sky thinking’ in all areas of the forensic process
- Lack of attention to fire investigation (including an evidence base for the processes undertaken and potential for contamination, and also human factors and interpretation at the scene, and a consideration of collaborative working with other agencies such as police/CSI – for example in terms of gaining 17020 accreditation)
- Forensic taphonomy, ecology, anthropology, and entomology. We have the expertise but not the financial or political support to bring the UK up to the standards of the USA, Australia or Europe. Research data generated from these countries are not directly applicable to the UK climate, and as such the evidence base in this area is lacking

**Question 4: How can the Criminal Justice System be equipped with robust, accurate and transparent forensic science?**

- The forensic process needs to be considered within the wider context of the investigation, reducing silo mentality and barriers between the science and its application. This will help to ensure accurate representation of scientific findings within the investigation and improve the value of the forensic process
- Specific funding calls and increased funding opportunities are needed to enable the delivery of research to support a robust, accurate, and transparent forensic science.

**Question 5: What channels of communication are needed between scientists, lawyers and the judiciary?**

- Communication and knowledge transfer needs to be improved between forensic practitioners and investigating officers so as to maximise the value of processes being undertaken
- The value and limitations of forensic evidence need to be clearly communicated at all levels. If a ‘take the best’ approach to evidence recovery or analysis has been taken then this needs to be clearly understood by the investigating officer and judiciary as a snapshot of information – rather than assuming that the full potential of the forensic evidence has been exploited
- Communication of forensic findings through the use of streamlined forensic reporting should be properly evaluated, to ensure it is robust and it is transparent
- Transparent communication is needed to explore and discuss risk within the forensic process
- Wider communication is needed between researchers, scientists, and legal professionals to ensure coherence between the evidence base and
frontline practice. Interdisciplinary communication is key to maximising the capability of research (for example learning from the aerospace or medical domain and knowledge transfer between veterinary and medical forensics)

**Question 6: Is the current training available for practitioners, lawyers and the judiciary appropriate?**

No. There are good examples of training in regions and some private training organisations are filling the gap, the delivery of general training in crime scene investigation, fingerprints and many other relevant disciplines is fragmented with no discernible national benchmark, framework or standard. Therefore, the following needs to be considered:

- Address the regional inconsistencies in practitioner training; establish a mandated, coherent and clear national standard for provision within scientific support
- Move from training to applied learning, producing an adaptable workforce in forensic science with individuals who are able to respond and react accordingly to anomalies and / or changes to systems, methods and processes
- Linked to the above, training or learning is not sufficiently comprehensive or dynamic to meet the changing needs of the landscape. Digital forensic capabilities, for example, are rapidly expanding these need to be understood by practitioners in the field as well as investigators and the judiciary
- Training may not encompass all stages of the process undertaken by a practitioner (for example fingerprint laboratory officers are not explicitly trained in fingerprint quality assessment\(^1\)). Practitioner training often neglects a comprehensive consideration of human factors and different types of knowledge and expertise

**Question 7: Is the current market for forensic services in England and Wales sustainable? Are changes needed to ensure forensic science provision is maintained at the level required? What are the risks of a market approach, for example what happens if a provider goes out of business? And what is the impact on quality?**

There are significant issues with the current market model for forensic services. Though, on the whole, forensic provision is delivered to a very high standard, looking at the system and evidence from recent events, the current approach to the provision of forensic services is prone to risk, it is vulnerable, and lacks resilience. Areas of specific concern are:

- Increased in-house provision of complex procedures, such as DNA search and recovery processes, can introduce further complexities to a market approach
  - This may pose a financial risk to FSPs who conventionally charge for this work, creating greater instability
  - There could be an impact of this shift on the quality of outputs. Adding extra decision making processes, conducted by individuals with varying levels of experience, could impact on integrity and

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quality. Achieving a balance between business need and quality is key.

- The varying pressures and priorities within user and supplier organisations can further complicate this arrangement. Providers are tasked with producing and interpreting results, but may not have the desired oversight at the start of the process if this is being conducted in house. Once again, this could impact on the integrity and quality of outputs. And if it does, where the responsibility lies needs to be identified.

- In the event of a provider going out of business, disseminating work to other providers places further stress on the balance of contractual TRTs, business need and quality. This could increase the disparity between user and supplier. This could have an influence on the in-house procurement of work, either by forces increasing their capabilities, or a reduction in positive communication.

**Question 8: Is the system of accreditation working successfully to ensure standardised results and the highest quality analysis and interpretation of significance of evidence?**

There is good evidence that in many areas the accreditation processes implemented are having a positive impact. However, there are areas where the task burden has increased at a time when resources are significantly stretched. There is a general lack of consistency and interpretation of requirements for accreditation and, in some areas, the accreditation mechanism used is not always fit for purpose for some areas of practice. More specific issues include:

- There are domains of forensic science lacking in standardisation, for example forensic entomology and aspects of digital forensics such as developments in 3D technology. There are also aspects of standardised forensic process that are not covered by the accreditation process. For example, ISO17025 in fingerprint laboratories does not cover aspects of fingerprint quality assessment comprehensively. Similarly within DNA analysis, whilst ISO 17025 ensures technical competency of laboratories, it does not compare and contrast performances (for example through blind proficiency testing) for all processes. As a result, how do we know that the best quality results are being achieved.

- Police forces are doing in-house research to ‘pick the best’ process within crime scene investigation to accredit so as to limit the cost and time implications of accreditation. This may be limiting in terms of maximising the forensic potential of a scene. The approach taken within the Fingermark Visualisation Manual in terms of determining categories of process and relating these to their level of readiness and central accreditation may be beneficial.

**Question 10b What can be learned from the use of forensic science overseas?**

- The Netherlands Forensic Institute alongside the Dutch National Police is an example of good practice in terms of academia-industry collaborative working and the adoption of working practices that consider the importance of human factors, for example the use of the ACE-ACE process in fingerprinting, and use of a probabilistic approach within fingerprint comparison.
There are some excellent examples of the use of taphonomic research facilities including the USA, Australia and the Netherlands. These facilities allow the comprehensive study of taphonomic processes within an environment that is valid to the ecological conditions of case work within each country, something that would be beneficial for the expansion of the entomological and taphonomic evidence base within the UK.

**Question 11 Is the ‘Forensic Science Strategy’ produced by the Home Office in 2016 suitable?**

- The Forensic Science Strategy highlights the need for a national approach in some aspects of forensic work and the dynamic nature of crime and, in turn, the dynamic requirements of the forensic domain.
- At times the data presented is too broad for the inferences being made e.g. number of attendances of CSI at burglaries demonstrated to be constant in the strategy; but is evidence recovered and submitted constant?
- The document paints an overly positive view of the current forensic science landscape e.g. para 36 – no widespread challenges of forensic science in the UK – Birmingham 6 case study fails to explain issues addressed or detail how
- The strategy does identify some key areas – but there are gaps – a more comprehensive consideration of the requirements of forensic science is required, thus the strategic aims are not specific enough

**Question 12 How should further research funding for forensic science be justified? What should be the focus of such research?**

- Research funding is required within forensic science in order to maximise the evidence base, and therefore maximise the value of forensic science to an investigation and the CJS
- The focus of research needs to be on increasing capability, efficiency and value as well as transparency and robustness
- Horizon scanning is important to ensure that research is future proof, particularly in areas of fast paced change such as digital forensics.
- UK Research and Innovation needs to appreciate the value of collaboration and interdisciplinarity and the importance of both a top down and bottom up approach, valuing the connectivity between blue skies thinking from across disciplines and practitioner problem solving
- Research should be considered in terms of the impact that it can make within forensic science practice and a mechanism (such as the FIT-IN network\(^2\) and Research for Justice research repository\(^3\)) should be supported to maximise the application of research and avoid duplication or rework
- Research publications should include the publication of negative results in order to allow a more comprehensive and transparent knowledge base and avoid the cost of uninformed research repetition. Research4 Justice may help with this in terms of the publication of research abstracts

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**Question 13** Where are the gaps in research and understanding of forensic science? How and by whom should the research questions be articulated to fill these gaps?

- There are a number of research gaps in forensic science. These are in relation to a comprehensive evidence base to support current practice and techniques, but also in terms of the continuing need for the development of novel techniques to meet the dynamic nature of criminal offences. Examples of areas with research gaps include the development of technology for scene reconstruction and the lack of a UK forensic ecology research facility.
- There is a particular gap in terms of research that addresses the human factors associated with the application of forensic techniques from crime scene to court, including during evidence collection, analysis, interpretation, and communication in court. Novel techniques such as advances in 3D technologies as applied to case work should be considered from a human factors perspective and empirical evidence is needed to assess the impact of the use of such technologies on juries.
- These research questions need to be articulated from a bottom up practitioner approach in order to ensure that research is applicable to operational forensic science. However research also needs to be used to support higher level strategic initiatives and transformation programmes so as to ensure that change is based upon a robust and relevant evidence base. In addition research must also be initiated from a blue skies and innovative perspective, harnessing the potential of an academic interdisciplinary approach, so as to encourage innovation to increase potential and value within our forensic processes. Partnership working between academic institutions and practitioner organizations with a structured approach to research (such as approach taken by the University of Portsmouth Forensic Innovation Centre) can be beneficial in enabling a synergy between this top down and bottom up approach and harnessing interdisciplinary research and innovation from across an academic institution.
- In order to maximise the impact of research and innovation wider collaboration and output sharing at a regional or national level would be beneficial. This would enable a strong interdisciplinary aspect to research, drawing on the academic and operational capabilities and strengths of different institutions to support the research objectives.
- Impact can also be maximised through the dissemination of research findings through a network (such as FIT-IN), maximising the uptake of outcomes nationally, enabling replication of research, and avoiding the cost of duplication.

**Question 14:** How can a culture of innovation in forensic science be developed and sustained?

- The Forensic (Science) Investigation and Technology Innovation Network (FIT-IN) can provide a network space for the sharing of research ideas, requirements and outputs, supporting a collaborative and interdisciplinary culture of research and innovation. FIT-IN will promote the uptake of existing sources of research requirements (such as the KTNI challenges database and the CAST (now DSTL) fingerprint research priorities) and the population of research outcome repositories (Research for Justice and the CoP research map). This collaborative and social space
linking key innovation stakeholders with academia-practitioner partnerships will help to increase access and provide a collaborative approach to innovation that is relevant to real world practice

- The Network and repositories will enable the tangible growth of research and innovation outputs, sustaining and driving momentum
- The dissemination of output and involvement of practitioners is key in embedding a change to a culture of innovation
- The Knowledge Transfer Network technology showcase is a useful event for drawing together academia, practice and innovative technologies

**Question 15: What are there current or anticipated skills gaps? Who should have responsibility for and/or have oversight of training?**

- A national level of oversight is required to provide consistency in training. Training, however, needs to be fit for purpose for the job roles and tasks being undertaken. To achieve this, the role profiles need to be better defined and nationalised to avoid this variation, similar roles are called different things and this introduces ambiguity. Thus comprehensive analysis of training needs based on the agreed role profile is required in order to ensure training is relevant and fit for purpose.
- The necessary evidence base around expertise and learning must be utilised to maximise the effectiveness of training delivered.
- Training needs to be dynamic and reflective of the changing forensic science landscape and inclusive of new knowledge, technology and processes.

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