# Applications of complexity science in policing – can agent-based simulation inform police policymaking?

Exploring an alternative to current analytical methods used in decision making.

## Key details

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| **Lead institution** | The Open University |
| **Principal researcher(s)** | Chief Superintendent Phil Davies<br>phil.davies@gmp.police.uk |
| **Police region** | South East |
| **Collaboration and partnership** | Professor Jeff Johnson, The Open University |
| **Level of research** | PhD |
| **Project start date** | December 2016 |
| **Date due for completion** | May 2023 |

## Research context

Complexity science is a young but growing multi-disciplinary theoretical framework dealing with the study of complex, dynamic and non-linear systems.

The growth of computing power has allowed application of theory into practice in examples as wide-ranging as economic modelling, traffic flow analysis, weather pattern prediction, and simulation of insect colonies – but not policing.

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Policing is a multilevel socio-economic system that would benefit from such application particularly in the design of new policy. Opportunities exist with the right research and investment to represent and experiment with policy design before implementation, to test their expected outcomes and save the public purse from unnecessary risk.

A principle tool in complexity science research is agent-based simulation. A model will be developed using qualitative and quantitative data to simulate changes in the workplace and measure the thresholds of workforce response.

The objective is to provide a vehicle for senior practitioners to engage in the concepts of complexity science and inform policy design.

# Research methodology

The objective of the research is to demonstrate agent-based simulation (ABS) is a viable alternative to existing analytical methods for supporting policy decisions.

The case study has a focus on a police community support officer (PCSO) team in one district, who have previously given responses to public-sector motivation surveys.

Using a grounded theory approach, 10 PCSOs were interviewed on workplace motivation and change. Their responses were coded to provide a multi-dimensional hypersimplex (mathematical representation of their environment) of impacts on motivation.

This hypersimplex is translated into a combinatorial process for exposing simulated PCSOs to various environmental factors that a change in policy may bring. (For example, lone patrolling, absence of supervision, or change of geographic ownership of tasks.)

# Interim reports or publications

Interim findings have been presented at various academic and policing conferences. A summary of the concept was published in Policing Insight in 2020 – see Complexity science and policing: Developing new tools to help make better policy decisions – Policing Insight.