Institution: University of Surrey

Unit of Assessment: 21 Sociology

Title of case study: Computational modelling approaches: Changing practice in UK public policy evaluation

Period when the underpinning research was undertaken: 2000-2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Professor Nigel Gilbert	Professor of Sociology, Director of CRESS and CECAN	September 1976 – present
Dr Peter Barbrook-Johnson	CRESS/CECAN Senior Research Fellow (UKRI Innovation Fellow)	October 2013-June 2016 June 2017 – January 2021
Dr Kavin Narasimham	CRESS Research Fellow	January 2015 – present
Dr Alexandra Penn	CRESS/CECAN Senior Research Fellow	October 2010 – present
Dr Thomas Roberts	CRESS Research Fellow, Lecturer in Sociology	August 2013 – present
Dr Maria Xenitidou	CRESS Research Fellow	October 2008 – present

Period when the claimed impact occurred: 2016 - 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

Capitalising on previous work on policy and innovation, Gilbert was well placed to initiate the Centre for the Evaluation of Complexity Across the Nexus (CECAN) to address the problem of complex policy evaluation within Government: transforming practice to make it fit for a complex world. Working with Government, research undertaken by CECAN has generated significant and impactful change in three key areas of policy and practice:

(i) Encouraging a cultural shift towards increased acceptance and awareness of complexity-appropriate policy evaluation methods at a range of levels within government;
(ii) Building capacity across multiple government departments to ensure that such methods are used appropriately; and
(iii) Ensuring wide-scale operationalisation of these methods by contributing directly to official government guidance on evaluation, including an annex to HM Treasury's Magenta Book.

2. Underpinning research (indicative maximum 500 words)

2.1 The Centre for the Evaluation of Complexity Across the Nexus (CECAN) operates within the Centre for Research in Social Simulation (CRESS) within the Department of Sociology at Surrey. CRESS, created by Professor Gilbert in 1990, has a long tradition of research on social simulation, computational sociology and complexity science. CRESS has established a wide-ranging research programme developing and supporting social simulation: Gilbert founded the main journal in the field, JASSS; co-founded the European Social Simulation Association (2003); published the first text (Gilbert and Troitzsch (U. Koblenz), (2005) *Simulation for the social scientist*. OUP) [3,681 citations]; and wrote the most popular guide to agent-based modelling (Gilbert, (2008, 2nd edn. 2019) *Agent-Based Modelling*. SAGE) [2,093 citations].

2.2 Through a wide variety of projects funded by the UK Research Councils, the European Commission and industry with a value totalling over £18 million, CRESS has made a number of theoretical and methodological innovations in modelling social phenomena and has developed and demonstrated the potential of computational modelling for assisting the appraisal, testing and evaluation of public policy. As examples, Narasimhan, Roberts, Gilbert and Xenitidou (2015) used agent-based modelling to clarify and apply social practice theory to explain variations in household energy use **[R1]**. Barbrook-Johnson, Badham, and Gilbert (2016) extended the well-known SIR epidemiological model to demonstrate that one can link theories of social behaviour with models of epidemic transmission to evaluate the effectiveness of communication policies when there is a threat of a pandemic **[R2]**. Using an agent-based model, Skeldon (Mathematics, Surrey), Schiller, Yang (Chemical and Process Engineering, Surrey), Balke-Wisser, Penn and Gilbert (2018) demonstrated the importance of choices made in the past in determining the effectiveness of environmental policies **[R3]**. Many of these studies had direct policy applications and the group's consolidated experience of the application of computational modelling to public policy decisions was summarised in Gilbert et al. (2018) **[R4]** and Calder et al. (2018) **[R5]**.

2.3 Gilbert's established expertise in the use of computer modelling for understanding the social world meant that he was uniquely positioned to build on existing relationships with government departments and convene a multidisciplinary, multi-organisation group of experts to improve the way in which policy evaluation is carried out. In 2016, CRESS launched the Centre for the Evaluation of Complexity Across the Nexus (CECAN), a research centre that is pioneering, testing and promoting innovative policy evaluation approaches and methods through a series of case studies with government departments. Within CECAN, new methods are being developed to describe and analyse the interaction between causal factors in complex policy arenas using computational modelling approaches, including dependency modelling, qualitative comparative analysis, Bayesian updating, process tracing, agent-based modelling and participatory system mapping. In a paper which has been downloaded over 4,100 times, Kolkman, Campo, Balke-Visser and Gilbert (2016) identified the criteria affecting model acceptance in policy making **[R6]**.
All authors mentioned in this section are or were members of CRESS, except where noted.

3. References to the research (indicative maximum of six references)
**Authors in bold are or were members of the Centre for Research in Social Simulation (CRESS).*

[R1] **Narasimhan K.**, **Roberts T.**, **Gilbert N.**, **Xenitidou M**. (2015) Using ABM to clarify and refine social practice theory*, Advances in Intelligent Systems and Computing*, Springer DOI: 10.1007/978-3-319-47253-9_27

[R2] **Barbrook-Johnson P.**, **Badham J.**, **Gilbert N.** (2016) Uses of agent-based modelling for health communication: The TELL ME case study, *Health Communication* 32 (8): 939-944 Taylor & Francis DOI: 10.1080/10410236.2016.1196414

[R3] Skeldon, A.C., **Schiller, F.**, Yang, A., **Balke-Visser, T.**, **Penn, A.**, **Gilbert, N.** (2018) Agent-based modelling to predict policy outcomes: A food waste recycling example, *Environmental Science & Policy*, 87: 85-91; DOI: 10.1016/j.envsci.2018.05.011

[R4] **Gilbert N.**, Ahrweiler P., **Barbrook-Johnson P.**, **Narasimhan K.**, Wilkinson H. (2018) Computational Modelling of Public Policy: Reflections on Practice, *Journal of Artificial Societies and Social Simulation* 21 (1): 1-14. DOI: 10.18564/jasss.3669

[R5] Calder M., Craig C., Culley D., de Cani R., Donnelly C., Douglas R., Edmonds B., Gascoigne J., **Gilbert N.**, Hargrove C., Hinds D., Lane D., Mitchell D., Pavey G., Robertson D., Rosewell B., Sherwin S., Walport M., Wilson A. (2018) Computational modelling for decision-making: where, why, what, who and how, *Royal Society Open Science* 5 (6) DOI: 10.1098/rsos.172096

[R6] **Kolkman, D.A., Campo, P., Balke-Visser, T.** and **Gilbert, N.** (2016) How to build models for government: criteria driving model acceptance in policymaking, *Policy Sciences*, *49*(4), pp.489-504. DOI: 10.1007/s11077-016-9250-4

Key research grant
Economic and Social Research Council, UKRI, Centre for the Evaluation of Complexity Across the Nexus (CECAN), £3,127,094 (March 2016 – May 2019 and March 2019 – August 2022)

4. Details of the impact (indicative maximum 750 words)

The Problem

4.1 In December 2013, the National Audit Office (NAO) described the Government's approach to policy evaluation as "*incomplete*", "*unclear*" and "*often not robust enough to reliably identify the impact*" (NAO, 2013. *Evaluation in government.* London, p.10). This is particularly problematic when considering complex policies, such as those in the food-water-energy-environment "Nexus". Working directly with government departments since 2016, CECAN has generated significant and impactful change in the way the UK Government approaches policy evaluation.

Part I. Shifting the culture

4.2 Since 2016, Gilbert and his CECAN colleagues have been trialling new evaluation approaches in a co-produced series of policy case studies that spans a multibillion pound policy portfolio across Defra (Rural Development Programme for England, RDPE), BEIS (Energy Trilemma, Renewable Heat Initiative and Energy Innovation Programme), Food Standards Agency (Regulating Our Future) and Environment Agency (Waste Crime), with smaller studies for the Health and Safety Executive and HMRC. The case studies, which required sustained dialogue and long-term relationship building with stakeholders in Government, have provided space for innovation within policy teams and have led to increased acceptance and awareness of complexity appropriate policy evaluation methods. One example is that, using participatory system mapping methods developed in CRESS, CECAN provided expert guidance to Defra policy and evaluation leads on how they can embed complexity-appropriate approaches into the evaluation of the £3.5billion investment in RDPE, and the future scoping of the rural development landscape post-Brexit. In 2018, CECAN worked with Defra to produce a systems map (and associated network analysis) across the areas of agricultural productivity, environmental land management, animal and plant health, and the rural landscape. A Defra Senior Analyst confirmed that this map is now being used internally within Defra to assist in the development of the post-Brexit Environmental Land Management policy: "*Outside of the Future Farming and Countryside Programme, the map was [also] used in an RDPE Deep Dive focused on the relationship between RDPE priorities and those of the new Environmental Land Management schemes."* **[S1]**

Defra confirmed that the work generated a deeper understanding within Defra of the interaction of the many policies in this area, how their aims and mechanisms overlap, the potential for unintended consequences, and identified evaluation priorities and opportunities **[S2]**.

4.3 This impact has spread as the original group of case study participants have promoted CECAN's approach to participatory systems mapping elsewhere in Defra and beyond e.g., Defra's Chief Scientific Adviser's Office and HMRC **[S1]**. CECAN has also been explicitly referenced in formal Invitations to Tender (ITT). For instance, Defra's ITT for a Complexity Evaluation Framework (October 2018) **[S3]** cited CECAN's briefing notes: *Policy evaluation for a complex world; and The visual representation of complexity: definitions, examples and learning points*, in support of the approach to evaluation they were adopting. Further afield, mentions of complexity with regard to evaluation and, more specifically, of CECAN can be found in a number of official government documents beyond Defra. For example, in the Food Standards Agency's Areas of Research Interest document (April 2017), CECAN is identified under "Strategic science partnerships" **[S4].**

4.4 This evidence demonstrates how the influence of CECAN's work has grown and spread to reach across multiple areas of Government, contributing to a culture shift that is increasingly ready to embrace complexity and acquire or refine skills in complexity-appropriate evaluation.

Part II. Building capacity and competency within Government

4.5 CECAN has established an extensive network of over 900 government representatives, practicing evaluators and researchers, academics, policy analysts, method and domain specialists, and representatives from professional organisations (e.g., the UK Evaluation Society and the Cross Government Evaluation Group), think tanks, industry and the third sector. The

network benefits from CECAN's comprehensive programme of capacity building seminars and professional development events. Between June 2016 and October 2020, CECAN ran 44 seminars/webinars, attracting 1,712 attendees and a further 5,634 views online following the events. In addition, CECAN has run 14 professional development events/workshops between February 2017 and October 2020, with attendance averaging around 20 participants per event, of which approximately two-fifths were from government departments, one-fifth from academic institutions and one-quarter evaluation consultants **[S5]**.

4.6 A survey of CECAN Network members, carried out at the end of 2017, reported that CECAN's work has not only helped to reduce cultural and institutional barriers and improve mutual understanding of evaluation framings, languages and models across government departments and between government and evaluation practitioner and consultants, but also contribute to a civil service that is better equipped to tackle their complex evaluation challenges **[S6]**. CECAN has also delivered bespoke training to government departments outside of those working in 'Nexus' areas, for instance to the Department for Education (April 2018); to Public Health England (November 2019); and to the Department for Digital, Culture, Media and Sport (April 2020).

4.7 In July 2018, CECAN launched a spin-out company, CECAN Ltd, with the University of Surrey holding 20% of the shares. CECAN Ltd has been designed to facilitate and increase CECAN's ability to offer bespoke training and consultancy within Government and beyond. CECAN Ltd has bid for and gained a number of projects for clients such as Defra, Innovate UK and the Food Standards Agency (FSA), as well as projects with partners from the Third Sector and UK Evaluation Society. This shows that CECANs approach is now sought after by a range of organisations. Between starting trading on 1 October 2018 and its most recent Financial Year end (31 July 2020), CECAN Ltd had a turnover of more than £125,000 **[S7]**.

4.8 The increasing popularity of CECAN's capacity building provision, spreading organically via both its research-based and commercial arms to new areas of Government, is testament to its success and effectiveness. CECAN has been able to ensure the correct use of the complexity-appropriate policy evaluation methods that it has been pioneering since its start. CECAN has now laid the groundwork for wide-scale operational change, ready to be adopted by a more open-minded and capable audience of policy professionals and evaluation practitioners.

Part III. Operationalisation

4.9 Gilbert and his CECAN colleagues were invited by government evaluators to contribute to an annex for the 2020 revision of the *Magenta Book*, the central guidance for all UK government departments on evaluation. The CECAN Supplementary Guide, Complexity in Policy Evaluation **[S8]** demonstrates CECAN's expertise in evaluation theory and practice, complexity science and experience in new methodologies. Compliance with the *Magenta Book* is a requirement for government evaluations and is referred to by commissioners and practitioners alike, hence its strategic importance and potential to have national impact on evaluation practice across Government. More than 200 policy analysts, evaluation professionals and other stakeholders participated in the interactive launch events that CECAN ran in London, Birmingham and online in Spring 2020.

4.10 Arising from this work, Defra contracted CECAN Ltd to produce a bespoke *Complexity Evaluation Framework* (CEF) to provide specific guidance to their policy analysts on the issue to consider when scoping, designing and commissioning policy evaluation studies. Following peer review, the CEF was published by Defra in January 2020 **[S9]**. After its release, Defra commissioned an independent evaluation of the CEF, which was carried out by Steer-ED Consultancy. The findings of this impact evaluation were published in October 2020 **[S10]** and concluded that: "*Although still in early stages of use, there is already some evidence that the CEF is changing behaviour – for example by encouraging a more holistic or nuanced approach to evaluation, the adoption of complexity-appropriate methods, or more stakeholder-driven approaches*" (Page 24, para 6.2).

4.11 *By contributing directly to official government guidance, CECAN has improved the Government's approach to complex policy evaluation and paved the way for its impact to continue to develop and grow well into the future.*

5. Sources to corroborate the impact (indicative maximum of 10 references)

[S1] Letter from Senior Operational Research Analyst, Future Farming & Countryside Programme, Defra, 20 October 2020: *"I cannot stress enough the degree of capacity building that working with CECAN has given my team […] We have also supported other teams, including […] Defra's Chief Scientific Advisor's Office, and, outside of Defra, colleagues in HMRC in running their own systems mapping workshops. The ability to facilitate these workshops and create useful analysis products simply would not have been possible without our work with CECAN."* (PDF)

[S2] Email from Head of Policy Evaluation Team, Future Farming Analysis & Evidence Division, Defra, 28 February 2018: *"Without CECAN we would never have had the capacity to generate this valuable tool for evaluation and policy making and our projects will certainly be of a far higher quality due to their involvement."* (PDF)

[S3] Pages 19 and 22 (of 36), Defra Invitation to Tender (Reference: ITT_4883), October 2018 (PDF)

[S4] Page 4 (of 5), "Strategic Science Partnerships", Food Standards Agency (FSA) Areas of Research Interest 2017-2018, April 2017 (PDF)

[S5] Summary information about CECAN's extended network, seminars and CPD events as at 9th August 2019. Sources: CECAN Mailing List (MailChimp, accessed: 9th August 2019); CECAN internal registration records; CECAN event feedback forms. (PDF)

[S6] Example comment from a respondent to a CECAN user survey of its capacity building activity (2017): *"I have just submitted a report to my employer which I hope to use to initiate discussions about changing our internal evaluations. Currently, I find there is inadequate concern with complexity and an over-reliance on collecting data through yes/no binary answers or Likert scales."* Similar examples are listed in a summary report in the evidence file. (PDF)

[S7] CECAN Ltd accounts up to the year ended 31 July 2020 (company number: 11489391) as published by Companies House: https://bit.ly/3kJUXlo and https://bit.ly/3oE8Gwt [last accessed: October 2020]

[S8] CECAN's 66-page *Annex on Complexity* for the *Magenta Book*, reference: CECAN (2020). *Magenta Book 2020 Supplementary Guide: Handling Complexity in Evaluation*. HM Treasury. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/879437/Magenta_Book_supplementary_guide._Handling_Complexity_in_policy_evaluation.pdf [last accessed: October 2020]

[S9] CECAN (2020). *Complexity Evaluation Framework*. Commissioned by the Department for Environment, Food and Rural Affairs (Defra). Available at: http://sciencesearch.defra.gov.uk/Document.aspx?Document=14675_ComplexityEvaluationFramework.pdf [last accessed: October 2020]

[S10] Findings from the independent evaluation of the impact of the Defra Complexity Evaluation Framework within Defra carried out by Steer-ED, October 2020. Available at: http://randd.defra.gov.uk/Document.aspx?Document=14917_EvaluationoftheComplexityEvaluationFramework.pdf [last accessed: October 2020]