



# Final Report from the Review of Complexity Science as an EPSRC Research Area

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## 1. Executive Summary:

The past five years have seen a decline in research funded through EPSRC classified as Complexity Science. Although there is a growing recognition of the importance of complexity and the need for a systems approach to research across many disciplines, EPSRC foresees a continuation of the relative decline in research classified purely as Complexity Science. The current strategic focus of the research area (described under “strategic focus” in the EPSRC research area rationale of [Complexity Science](#)) is to support Complexity Science research informed by real world complex problems in order to attract the best possible cooperation between researchers and problem holders for the benefit of the UK society and economy.

This review articulates the challenges and opportunities for Complexity Science going forward, drawing from an evidence base consisting of funding data, analysis of third party evidence sources and community discourse. The Complexity Science community has made a significant contribution to this review and makes the following recommendations:

1. Complexity scientists, researchers interested in Complex Systems and problem holders should engage in a dialogue to formulate a forward looking vision for Complexity Science and Complex Systems research.
2. Complexity scientists are encouraged to proactively engage with and contribute to the research challenges articulated in the EPSRC Delivery Plan Outcomes Framework and opportunities such as, but not limited to, the Global Challenges Research Fund (GCRF) and the Industrial Strategy Challenge Fund (ISCF).
3. Complexity scientists are encouraged to engage with the peer review process by articulating their expertise in Complexity Science / Complex Systems clearly (by correctly populating their Je-S profile for example) and by agreeing to review research proposals from a Complexity Science / Complex Systems perspective.
4. Research in Complexity Science is informed by real world challenges, and complexity scientists are urged to, where appropriate, proactively engage in co-creative research involving problem holders from the start.
5. There was acknowledgement of the need for funding of fundamental, theoretical research with potential impact only becoming tangible in the longer term. To provide research councils with the evidence and confidence to keep making the case in favour of fundamental research, applicants need to be able to formulate a credible Pathway to Impact by thinking creatively about the next step for their research in the innovation pipeline past the end of their project.

## 2. Background

Over the years, many definitions of Complexity Science have emerged, generally agreeing that Complexity Science studies the behaviour of systems consisting of large numbers of interacting components that interact with and adapt to their environments, leading to emergent behaviours. The current EPSRC definition for the research area of Complexity Science reads as follows:

*“(Complexity Science) explores the emergent behaviour of complex systems by focusing on interconnections of system components and on systems architecture, rather than the individual components themselves. This research area represents a novel scientific approach that works across traditional discipline boundaries. Examples of Complexity Science range from forecasting and decision-making processes, whole-system multi-scale models and data-intensive science, to fundamentally understanding complex behaviour itself.”*

Complexity is an inherent property of many large systems and aspects of complexity science can be regarded as integral parts of other research areas such as, non-linear systems, continuum mechanics, mathematical biology or operational research; as well as broader themes, such as, systems engineering, systems biology or network science. As such, research in the area of Complexity Science can have an influence far beyond the remit of EPSRC and can influence fields including, biology, medicine, and the social sciences.

As the recognition of the importance of taking a “whole systems view” has grown across the EPSRC research community, Complexity Science approaches and methodologies have become ever more embedded in various aspects of the EPSRC research portfolio. However, the big questions in complex systems research, such as the effects of climate change, questions around data science, population dynamics, biological systems and smart cities remain.

Over the past delivery plan period, Complexity Science, as a research area, has reduced as a proportion of the EPSRC portfolio, as previous large investments have come to an end. In addition, success rates for Complexity Science as a research area through standard mode have been low (success rates consistently below average for the past 6 years<sup>1</sup>) and a fellowship priority area at the postdoctoral career stage only drew limited interest. Together with the increasingly blurred boundaries with other research areas, EPSRC anticipates a reduction in Complexity Science as a proportion of the EPSRC research area portfolio and this is reflected in our [Balancing Capability strategy](#).

To better understand how to support excellent research in Complexity Science going forward, EPSRC instigated a review into [Complexity Science as a research area](#). By investigating our own data and consulting with the community, we aimed to:

- Get a better understanding of the research that is currently funded in Complexity Science across the EPSRC portfolio and its links to other parts of the RCUK (now part of UKRI) funding landscape.
- Understand how research in Complexity Science has changed over the past 5-10 years.
- Understand the effects that Complexity Science has had on the research landscape in the UK.
- Make a recommendation on how best to support excellence in Complexity Science and complex systems research in the future.

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<sup>1</sup> Evidence Source: internal EPSRC data

### 3. Methodology

This review was carried out over the course of a year in 2017, drawing on research data from [Gateway to Research](#) and [Grants on the Web](#), as well as other EPSRC data and published reports. Key sources of evidence were:

1. Analysis of EPSRC student, fellowship and grant data
2. [ENCORE Network +](#), Challenges of Complexity and Resilience in Complex Engineering Systems – Challenge Note to EPSRC, (2017)
3. EPSRC, [Systems Engineering Workshop Report](#), (2017)
4. OECD Insights, [Complexity and Policy Making](#), (2017)
5. EPSRC, [Mathematical Sciences Community Overview Documents \(PDF\)](#), (2016)
6. Research Excellence Framework (REF) 2014: [Overview Report by Main Panel B and Sub-panels 7-15 \(PDF\)](#), (2014)
7. EPSRC, [International Review of Mathematics \(PDF\)](#), (2011)

The research community was asked to contribute to the review at the following stages:

- A panel of experts was invited to a scoping workshop in April 2017 (see [Scoping Workshop](#))
- An online community consultation was launched via the EPSRC website in summer 2017 (see [Community Consultation](#))
- The results from the consultation were discussed at a community workshop in November 2017 (see [Community Workshop](#))

## 4. Portfolio Analysis

### 4.1 Historic Perspective

EPSRC began supporting Complexity Science research in the early to mid-2000s and EPSRC's Cross-Disciplinary Interface Programme (CDIP) invested in a number of focused activities and capability building initiatives, such as:

- £12 million of research funded in novel computation: coping with complexity
- £10 million investment in a 5-year centre in Large Scale Complex IT Systems
- £14.5 million over five years for Life Sciences Interface Doctoral Training Centres in Complexity Science and £13.5 million over five years for Complexity Science Centres for Doctoral Training
- £2.5 million for Fundamentals of Complexity Science Call 2007 – 10 projects

Complexity Science was also a priority area in the subsequent call for Centres for Doctoral Training in 2009. It was not a named priority in the 2013 CDT call or the 2018 CDT call.

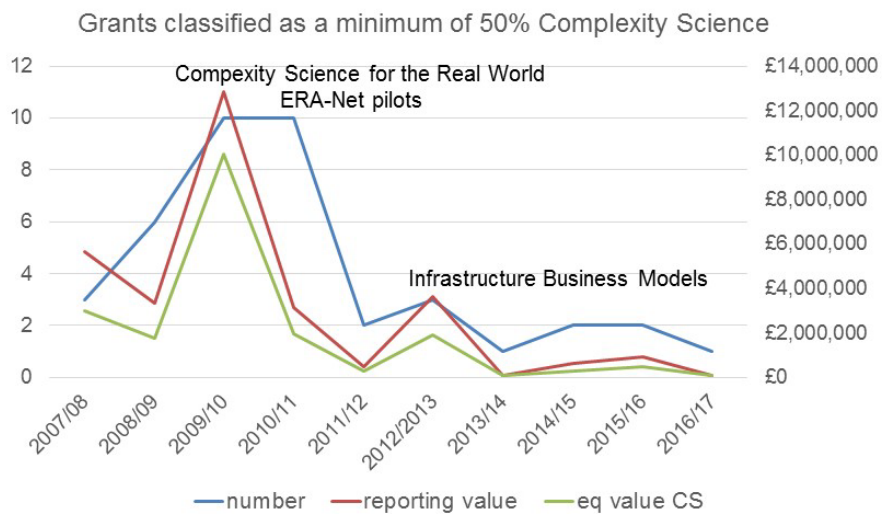
Furthermore, EPSRC coordinated a network of 11 funders from across Europe through the ERA-NET [Complexity-NET](#) from 2006-2010.

EPSRC grant activity classified as Complexity Science peaked following these strategic interventions (Figure 1). Some grant holders went on to win large grants from research councils, sustaining and broadening research activity related to Complexity Science. Examples are the [Centre for Population Change](#) at Southampton or the [Centre for the Evaluation of Complexity Across the Nexus](#) (CECAN) at the University of Surrey.

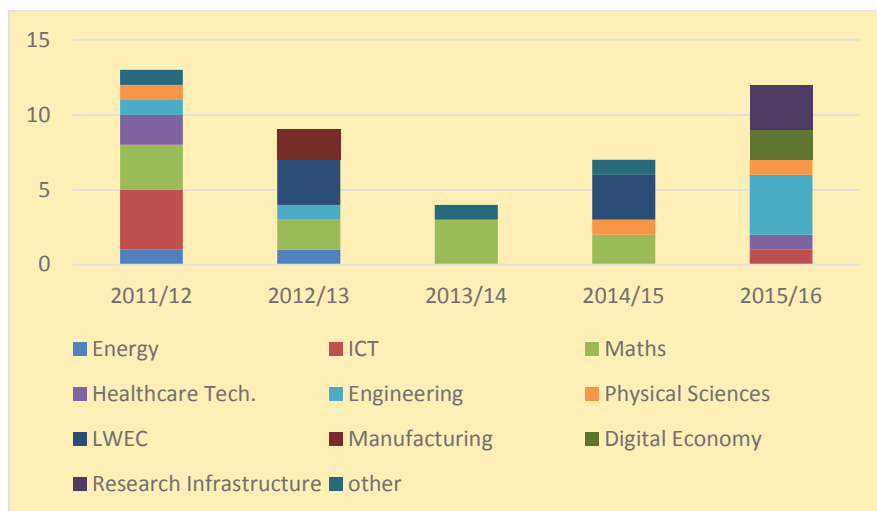
In addition, several Universities set up Institutes for Complexity Science and complex systems research, including the [Centre for Complexity Science](#) at the University of Warwick, the [Institute for Complex Systems and Mathematical Biology](#) at the University of Aberdeen or the [York Cross-Disciplinary Centre for Systems Analysis](#).

From an EPSRC perspective, the number of grants identified as majority Complexity Science, has decreased following early strategic interventions (**Figure 1**), and a separate fellowship priority area at the postdoctoral career stage, failed to attract large numbers of applications<sup>1</sup>.

On the other hand, there is a clear appreciation for the need of a complex systems level approach to research across the disciplines in the remit of EPSRC, evidenced by the wide spread of themes supporting complexity science research grants as lead theme over the past 5 years (**Figure 2**)



**Figure 1:** Graph showing the number of EPSRC research grants coded 50% or more to the research area of Complexity Science, their total reporting value and their equivalent value classified as Complexity Science over the past 10 years. This analysis does not include training grants.



**Figure 2:** Lead Themes<sup>2</sup> for EPSRC funded research grants (including programme grants) and fellowships, partly classified as Complexity Science, with decision dates from 2011/12 – 2015/16.

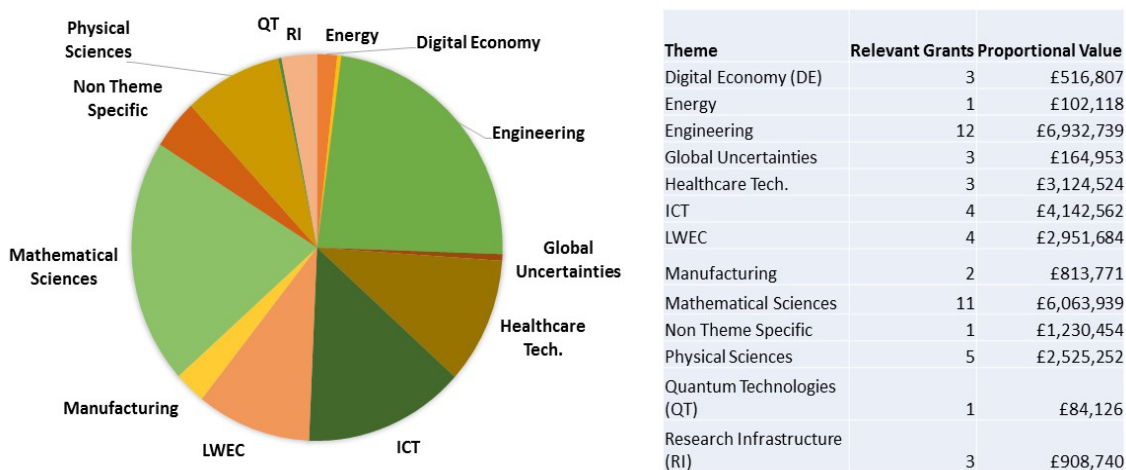
<sup>2</sup> LWEC: Living with Environmental Change

## 4.2 Current Portfolio

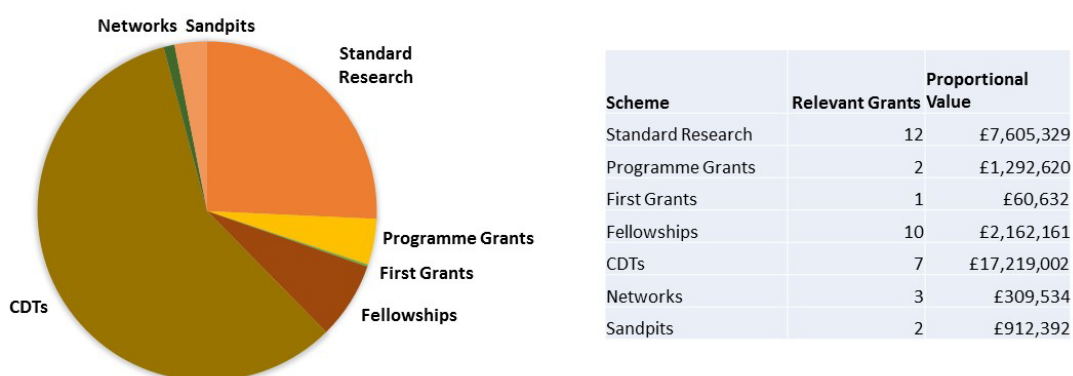
Investigation of the current<sup>3</sup> EPSRC portfolio of grants using the online [Visualising our Portfolio](#) tool (VoP) reveals that only 0.63% of the EPSRC portfolio is currently classified as Complexity Science, resulting in a proportional value<sup>4</sup> of £29.6M (**Figure 3**). This amounts to a decrease of 0.13% (£4.7M) since the end of April 2017. The Complexity Science portfolio is supported by a wide range of themes, with the Mathematical Sciences and Engineering holding the majority of around 20% by grant value and number (**Figure 3a**). It is noticeable that 58% of the Complexity Science portfolio by value was committed to the CDTs<sup>5</sup>, 60% of which will have come to an end by spring 2019 (**Figure 3b**).

Until September 2017 a fellowship priority area in Complexity Science was open at the postdoctoral career stage. However, this priority area drew very few applications and by the time the priority area closed, only 2 postdoctoral fellowships had been awarded. Nonetheless, Complexity Science features in 10 currently active fellowship grants across a variety of thematic areas and career stages (**Figure 3b**, for further details refer to [VoP](#)).

a)



b)



**Figure 3:** [VoP](#) data for Complexity Science; a) shows the split according to lead theme and b) according to scheme by number of relevant grants and the proportional value classified as Complexity Science<sup>4</sup>. The pie chart shows the percentage split in proportional grant value.

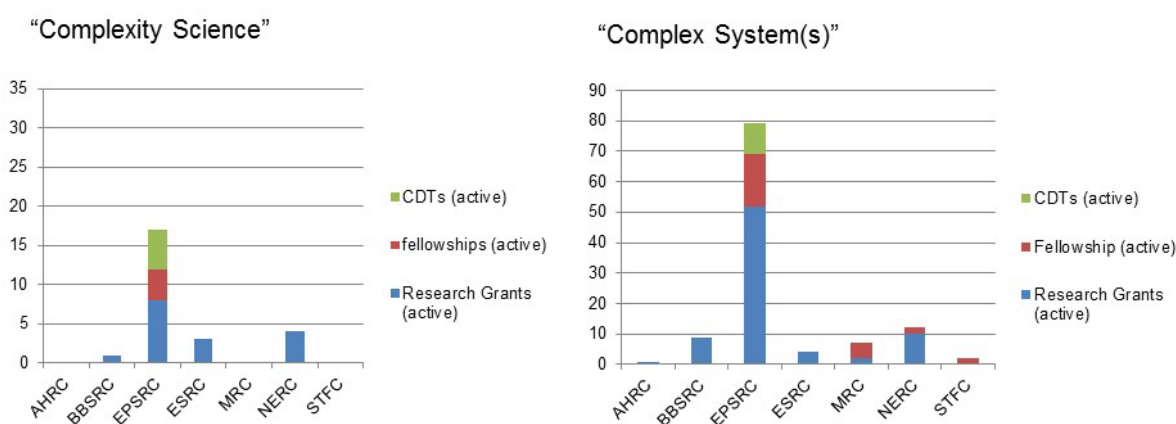
<sup>3</sup> Date of [VoP](#) snapshot: 13<sup>th</sup> December 2017

<sup>4</sup> Proportional value = Research Area Percentage x Grant Reporting Value

<sup>5</sup> CDT: Centre for Doctoral Training

Without any active strategic intervention to boost the size of the portfolio, Complexity Science is thus likely to have reduced as a proportion of the EPSRC research portfolio by the end of the current delivery plan, in line with the current Balancing Capability Strategy for the research area.

In order to gain a wider picture of the research landscape of Complexity Science and complex systems research in the UK, data from [Gateway to Research](#) were analysed. This tool, which provides access to funded grants across all research councils should give an indication for whether the assumption that Complexity Science is relevant beyond the remit of EPSRC, is true. Separate keyword searches in titles and abstracts were carried out for the terms “Complexity Science” and “Complex System(s)”, as well as “complexity OR complex AND science” and “complexity OR complex AND system”. A detailed analysis can be found in [ANNEX 1](#). In summary, it is clear that while EPSRC holds the majority share of grants which mention the search terms in their titles or abstracts and are thus likely to be of relevance to either Complexity Science directly or Complex Systems research more broadly, there is significant interest from researchers across the remit of all research councils<sup>6</sup> (see **Figure 4**).



**Figure 4:** Number of funded projects across research councils mentioning “Complexity Science” or “Complex System(s)”. [Gateway to Research](#) analysis April 2017.

## 5. Scoping Workshop

On 25 April 2017, EPSRC invited a number of experts from a broad range of research disciplines that relate to Complexity Science to discuss the following:

- Understand which major research challenges demand complexity science to be successfully tackled.
- Define all stakeholder constituencies in order to involve them in the review.
- Start thinking about how Complexity Science is best supported going forward and what work needs to be done to be able to answer this question.
- Start thinking about how and when to involve the wider community in the review.

The main findings from the workshop can be summarised as such:

- Complexity Science is intrinsically cross-disciplinary and relevant challenges in the real world require researchers from a range of disciplines to work together in a co-creative manner. This kind

<sup>6</sup> When looking at the number of funded grants across research councils, the relative size of the budgets for the different councils should be kept in mind.

of working relationship requires time and effort to develop and a willingness from all parties to collaborate as equal partners.

- Complexity Science at its best is ideally placed to break up silos. To do this it must look beyond the boundaries of simplistic models and seek to address real world challenges. There is a growing recognition that many long-standing problems faced by industry and society require complexity science approaches. Complexity is seen as an emerging topic in the engineering sector and in defence, and there have been recent substantial investments in research in this space internationally<sup>7</sup>.
- To be able to bridge the gap across disciplines as well as between researchers and problem holders, it is important that the UK supports the training of people with the ability and willingness to communicate beyond their domain expertise and understand how to work together to solve interconnected and complex problems.

The workshop participants recommended the following actions.

To best support research into complex global challenges, EPSRC should:

1. avoid perpetuating silos
2. frame support for Complexity Science around real world challenges
3. support longer, larger, co-creative, cross-disciplinary research endeavours alongside currently available standard schemes and allow for an appropriate level of risk to fulfil the high reward potential offered by such projects

All research councils should:

1. work together to allow support for research that addresses the complex global challenges faced by humanity in the 21<sup>st</sup> century
2. train people who are able and willing to communicate and work across discipline boundaries

A full [report from the scoping workshop](#) can be found on the EPSRC website.

## 6. Community Consultation

The recommendations from the scoping workshop were tested in an online community consultation. 53 complete and 4 partial, but usable responses were received. Participants were asked to state their level of agreement with 7 key statements from the scoping workshop from 1=strongly agree to 5=strongly disagree.

The statements put to the test were:

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<sup>7</sup> Examples include:

Complexity Science Hub Vienna: <http://csh.ac.at/index/>

New England Complex Systems Institute: <http://necsi.edu/>

NTU Complexity Institute: <http://www.complexity.ntu.edu.sg/Pages/default.aspx>

Future ICT: <http://futurict.inn.ac/>

Centro de Ciencias de la Complejidad: <http://c3.unam.mx/>



- I. Over the past 10 years, Complexity Science approaches and methodologies have become ever more embedded in other areas of research.
- II. Support for Complexity Science should focus primarily on research which seeks to address real world challenges.
- III. Complexity Science is a good starting point to break up silos in other research areas.
- IV. Complexity Science is well placed to bridge the gap between researchers and problem holders.
- V. Researchers working in Complexity Science in the UK generally do a good job of working across discipline boundaries.
- VI. Training PhD students in Complexity Science has a substantial impact on the UK research landscape.
- VII. The research area of Complexity Science is important beyond the academic community.

In general, there was strong agreement with most statements (see [Annex 2: Results from the Community Consultation](#) for full results). All except Question 2 achieved levels of agreement (agree or strongly agree) above 90%. The highest level of agreement was reached for Question 7, where 97% of participants either agreed or strongly agreed. Approximately equal numbers of participants agreed and disagreed with Question 2, which suggested that “support for Complexity Science should primarily focus on research which seeks to address real world challenges”. Participants were also invited to further comment on each statement in free text. Unsurprisingly, Question 2 attracted most comments. These were further analysed during the subsequent community workshop (see [Community Workshop](#)).

In a second part (Question 8), participants were asked to rank a series of measures in order of how effective you think they might be in providing appropriate support to the area of Complexity Science over the next few years, given the need for the area to reduce as a proportion of the EPSRC research portfolio between now and 2020.

The three top ranked measures are:

- 1) Retain the area of Complexity Science while increasing emphasis on cross-disciplinary activity.
- 2) Take action to improve collaboration and coordination across the field of Complexity Science.
- 3) Encourage applicants to address real world challenges.

## 7. Community Workshop

On 22<sup>nd</sup> November 2017, a community workshop was held in Bristol to discuss the outcomes of the community consultation. 42 expressions of interest were received from researchers spanning a wide range of interests, from mathematics to engineering, from the social sciences to public health. All applicants were invited to the workshop and 36 confirmed their attendance. Research Council representatives from BBSRC and MRC supported the event in addition to EPSRC colleagues from the Physical and Mathematical Sciences, Information and Communication Technologies and Impact.

EPSRC presented the outcomes of the review to date and four experts from different research disciplines presented their perspectives on the past successes of and future opportunities for Complexity Science and Complex Systems Research.

Attendees were asked to suggest concrete actions to implement the top three recommendations from Question 8 of the community consultation (see [Community Consultation](#)). Actions had to be assigned to either EPSRC, [UKRI](#) or researchers themselves.

The groups were encouraged to widen the discussion to further recommendations they could agree to in response to Question 8 from the survey.

Outputs from the discussion<sup>8</sup> are listed below:

Recommendation	Actions		
	<b>EPSRC</b>	<b>Researchers</b>	<b>UKRI</b>
1) Retain the area of Complexity Science while increasing emphasis on cross-disciplinary activity.	<ul style="list-style-type: none"> <li>• Rename area to “Complex Systems”</li> <li>• Convene a separate panel for inherently cross-disciplinary proposals</li> <li>• Add “cross-disciplinary” as explicit expertise in reviewer profile</li> <li>• Enhance / review the definition of complexity science</li> <li>• Review the peer review process to improve chances for cross-disciplinary proposals</li> <li>• Highlight importance of complexity science to UKRI agenda and industry</li> <li>• Improve pool of complexity science reviewers</li> </ul>	<ul style="list-style-type: none"> <li>• Learn to communicate with other disciplines</li> <li>• Avoid building our own silos</li> <li>• University services to help/support cross-institute / cross-departmental collaboration</li> <li>• Enable road-mapping for the area</li> </ul>	<ul style="list-style-type: none"> <li>• Acknowledge importance of methods to tackle complex systems problems across all research disciplines</li> <li>• Review the success of the Cross Disciplinary Interface Programme (CDIP) and consider reinstating a similar programme</li> <li>• Facilitate tax relief for studentships/research</li> <li>• Improve cross-council funding mechanisms</li> </ul>
2) Take action to improve collaboration and coordination across the field of Complexity Science	<ul style="list-style-type: none"> <li>• Facilitate industry engagement</li> <li>• Facilitate engagement with NHS, police, etc.</li> <li>• Brokerage</li> <li>• Platform for funding visits and collaborations</li> <li>• Provide examples of good collaborations</li> <li>• Promote links with data science, discrete maths, statistics, fundamentals, physics, applications and machine learning</li> <li>• Sponsor networks and workshops / travel grants</li> <li>• Prevent Complexity Science being hijacked by one specific discipline</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitate industry engagement</li> <li>• Big Ideas initiative for complex systems</li> <li>• Need to change view/perception of area</li> <li>• Work on external interactions</li> <li>• Participate actively in knowledge transfer</li> <li>• Need good evidence of impact</li> <li>• Put ourselves on the map by completing the Je-S profiles (use Complexity Science keywords)</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitate engagement with NHS, police, etc.</li> <li>• Enable cross-disciplinary and cross-boundary research</li> <li>• Support a complexity summer school</li> </ul>

<sup>8</sup> Similar outputs were collated and articulated as a single action. A few actions which lie outside the remit of either EPSRC or UKRI were deleted.

	<ul style="list-style-type: none"> <li>• Articulate relationship between emergence and Grand/Global Challenges</li> </ul>		
3) Encourage applicants to address real world challenges	<ul style="list-style-type: none"> <li>• Acknowledge cost of cross-disciplinary research</li> <li>• Communication of definition of problems</li> <li>• Include “real world” experts in the assessment process</li> <li>• Allow new ways of working beyond the current standard schemes</li> <li>• Re-embed complexity in discourse around data science, AI, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Acknowledge domain expertise</li> <li>• Foster relationship with data science</li> <li>• Sign up to reviewer college</li> <li>• Identify problem domains with complexity solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Don’t prescribe real world problems: let problem owners speak up!</li> <li>• Support translational grants to demonstrate Complexity Science</li> </ul>
Additional recommendation 1: Support fundamental research	<ul style="list-style-type: none"> <li>• A focus on real world systems should not come at the expense of research in fundamental complexity problems and tools</li> </ul>		<ul style="list-style-type: none"> <li>• Appreciate need for fundamental research</li> <li>• Focus limited core funding on development of core theoretical tools. Combine this with collaborative / networking activities to stimulate fundamental research</li> </ul>
Additional recommendation 2: Wider exposure and awareness to professional bodies	<ul style="list-style-type: none"> <li>• Celebrate importance of Complexity Science</li> <li>• Promote Pathways to Impact actions</li> <li>• Engage with industry with interest in Complex Systems</li> </ul>	<ul style="list-style-type: none"> <li>• Make use of Impact Acceleration Account funding</li> <li>• Public engagement</li> <li>• Raise awareness</li> <li>• Don’t be afraid to ask for funds related to Pathways to Impact</li> </ul>	
Additional recommendation 3: Recognise Complexity Science as an independent discipline	<ul style="list-style-type: none"> <li>• Review peer review system to make it fit for purpose for cross-disciplinary research</li> <li>• Support Early Career Complexity Scientists</li> </ul>	<ul style="list-style-type: none"> <li>• Universities could create a Complexity Science Department</li> </ul>	

The second facilitated session asked groups of participants to formulate a maximum of 5 recommendations for the review, based on the evidence provided, as well as their own expertise, and discuss strengths, weaknesses, threats and how to overcome them (SWOT) for each.

The different responses were collated and summarised into a summary set of recommendations, and the participants were invited to vote for their top three recommendations anonymously via [socrative](#).

The results are shown on the next page:

A	Linking grand challenges with complexity sciences	13%
B	Ensure continued funding of fundamental research	18%
C	Enhance understanding and appreciation of the value of complexity among key stakeholders outside the core community	5%
D	Evaluation of proposal in cross-disciplinary contexts	17%
E	Keep training new generations of 'complex systems' scientists	12%
F	making opportunities for more connections	3%
G	Need to promote world-leading research in complexity science	9%
H	Fund large teams	3%
I	Use current infrastructure (ICMS/INI) to set agenda	0%
J	Realise that the sum of the parts is greater than the whole	1%
K	UKRI should take responsibility for enabling cross-disciplinary work and removing barriers	19%

Further themes that were discussed on the day can be summarised as follows:

- There was a sense of a current lack of identity in Complexity Science among parts of the community. There is an opportunity for the research community to come together and redefine the meaning of Complexity Science and its interface with Complex Systems Research.
- The EPSRC prosperity outcomes framework makes reference to four inherently complex systems: a productive nation, a connected nation, a resilient nation and a healthy nation. There is ample opportunity for Complexity Scientists to contribute towards all of these delivery plan outcomes.
- Complexity Science spans across the traditional discipline and faculty boundaries and does not fit within one particular pre-existing area.
- Research proposals in Complexity Science and complex systems research are almost always highly cross-disciplinary. The way the peer review system is set up heavily relies on subject expertise and does not favour cross-disciplinary work. UKRI presents a new opportunity for excellent cross-disciplinary research and a smoother interface between individual subject domains.
- While a focus on connecting with real world problems is welcomed, this should not come at the expense of support for new theoretical and methodological developments.
- Real world problem often get conflated with government priorities. This may not always be appropriate, and there should be an opportunity for the research community to contribute to the definition of a real world problem.
- There is still a place for a research area of Complexity Science as a pointer to a systems approach to problem solving. Complexity scientists are uniquely placed to develop tools and methodologies for emergent system behaviours in many scientific disciplines and application domains.
- The CDTs in Complexity Science are producing a new generation of scientists skilled in working with complex systems. While graduates find ample opportunity to thrive in private business (data analytics, AI, financial services), it is less clear how they are supported on an academic career path. There is a danger that the UK strength in Complexity Science and Complex Systems research will get lost over time if early career researchers fail to be supported.

## 8. Conclusions and Recommendations

[Complexity Science](#) as a research area is expected to reduce as a proportion of the EPSRC research portfolio over the course of the current delivery plan. This is in line with the current strategic trajectory for the research area which was set as part of [our Balancing Capability Strategy](#) published in February 2017. This is to a large extent a result of a number of large grants coming to an end, that were funded through managed activities in Complexity Science, including several CDTs. The reduction is also driven by the relatively low success rates and low number of Complexity Science applications received in standard mode.

It is clear that Complexity Science is of relevance to a wide range of disciplines across and beyond the Physical and Mathematical Sciences and Engineering.

There is a recognition among the Complexity Science community that it is imperative for the health of the discipline to communicate the contributions that Complexity Science has to offer towards the aims of solving some of the great complex challenges of today's society. A dialogue is needed between researchers working on fundamental methodological and theoretical advances in Complexity Science at one end, and researchers interested in applying those methods to their research of complex systems at the other end, in order to redefine the purpose and vision for Complexity Science research for the 21<sup>st</sup> Century.

The Complexity Science community has recommended the following actions to be considered in order to ensure that the UK stays at the forefront of excellent research in Complexity Science for the benefit of the wider society and the UK economy:

1. Complexity scientists, researchers interested in complex systems and problem holders should engage in a dialogue to formulate a forward looking vision for Complexity Science and complex systems research.
2. Complexity scientists are encouraged to proactively engage with and contribute to the research challenges articulated in the EPSRC Delivery Plan Outcomes Framework and opportunities such as the Global Challenges Research Fund (GCRF) and the Industrial Strategy Challenge Fund (ISCF).
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## 9. Acknowledgements

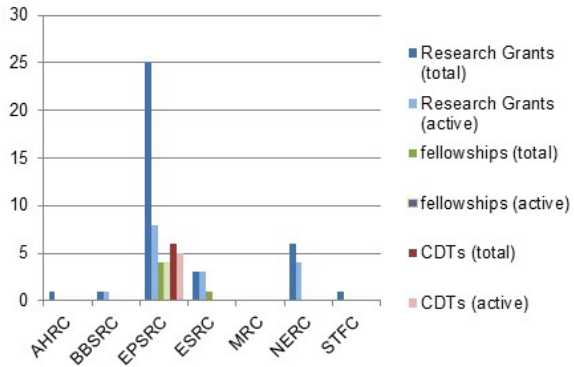
This review would not have been possible without the help of many people across research councils and the research community. We would like to specifically thank

- The EPSRC Performance and Evaluation Team, and particularly Sushma Tiwari, for their help with the data analysis,
- the cross-council support team: Peter Burlinson (BBSRC), Samuel Rowley and Richard Evans (MRC), Christopher Gibson, Nyree Hill and Jaspreet Kular (all EPSRC) and Sophie Martin (ESRC)
- the participants of the scoping workshop: Jean-Baptiste Cazier, Alan Champneys, Colm Connaughton, Thomas Gaertner, Tobias Galla, David Harvey, Jane Hillston, Ray Ison, Marta Kwiatkowska, Lucas Lacasa, Stephen Mobbs, Guy Moss, Alex Penn, Susan Stepney and Marzena Szymanska
- the speakers at the community workshop: Netta Cohen, Robert MacKay, Alex Penn and Susan Stepney.
- Everybody who engaged with the review through responding to the community consultation, providing supporting evidence and taking the time to provide their perspective and expertise.

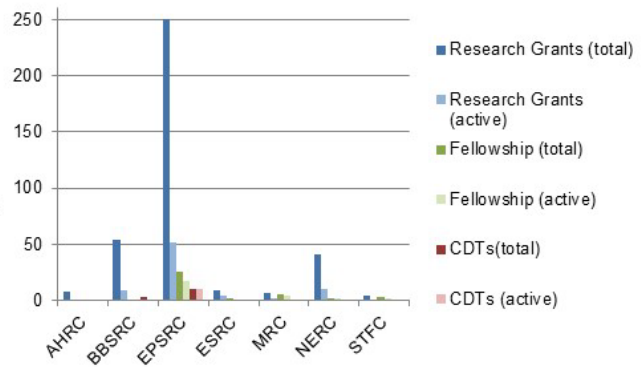
## Annexes:

### Annex 1: Gateway to Research Analysis

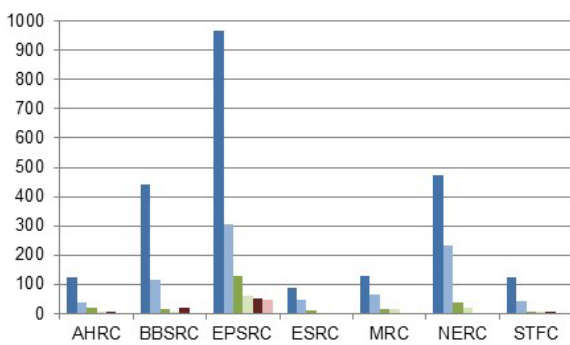
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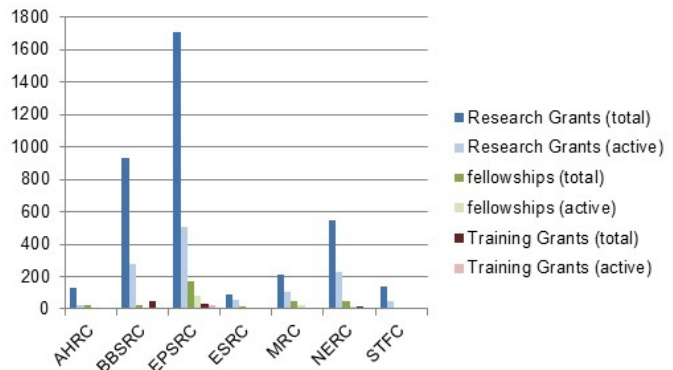
“Complex System(s)”



complexity OR complex AND science








complexity OR complex AND system








Number of project published on [Gateway to Research](#) (GtR) as of April 2017, featuring the search terms “Complexity Science”, “Complex System”, “complexity OR complex AND science” or “complexity OR complex AND system” split by lead funding council and colour coded according to funding scheme. Dark shades refer to total number of grants on GtR, light shades to grants that were active as of April 2017. Searches for “Complex System” and “Complex Systems” returned the same number of results.

## Annex 2: Results from the Community Consultation




**1. "Over the past 10 years, Complexity Science approaches and methodologies have become ever more embedded in other areas of research" To what extent do you agree or disagree with this statement?**

			Response Percent	Response Total
1	Strongly Agree		35.85%	19
2	Agree		37.74%	20
3	Neither Agree nor Disagree		15.09%	8
4	Disagree		5.66%	3
5	Strongly Disagree		5.66%	3

**2. "Support for Complexity Science should focus primarily on research which seeks to address real world challenges" To what extent do you agree or disagree with this statement?**



			Response Percent	Response Total
1	Strongly Agree		16.98%	9
2	Agree		22.64%	12
3	Neither Agree nor Disagree		20.75%	11
4	Disagree		26.42%	14
5	Strongly Disagree		13.21%	7

**3. "Complexity Science is a good starting point to break up silos in other research areas" To what extent do you agree or disagree with this statement?**

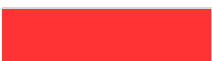




			Response Percent	Response Total
1	Strongly Agree		47.17%	25
2	Agree		26.42%	14
3	Neither Agree nor Disagree		20.75%	11








**3. "Complexity Science is a good starting point to break up silos in other research areas" To what extent do you agree or disagree with this statement?**

			<b>Response Percent</b>	<b>Response Total</b>
4	Disagree		1.89%	1
5	Strongly Disagree		3.77%	2






**4. "Complexity Science is well placed to bridge the gap between researchers and problem holders" To what extent do you agree or disagree with this statement?**

			<b>Response Percent</b>	<b>Response Total</b>
1	Strongly Agree		45.28%	24
2	Agree		37.74%	20
3	Neither Agree nor Disagree		13.21%	7
4	Disagree		1.89%	1
5	Strongly Disagree		1.89%	1






**5. "Researchers working in Complexity Science in the UK generally do a good job of working across discipline boundaries" To what extent do you agree or disagree with this statement?**

			<b>Response Percent</b>	<b>Response Total</b>
1	Strongly Agree		34.62%	18
2	Agree		36.54%	19
3	Neither Agree nor Disagree		17.31%	9
4	Disagree		9.62%	5
5	Strongly Disagree		1.92%	1

**6. "Training PhD students in Complexity Science has a substantial impact on the UK research landscape" To what extent do you agree or disagree with this statement?**

			<b>Response Percent</b>	<b>Response Total</b>
1	Strongly Agree		47.17%	25
2	Agree		24.53%	13
3	Neither Agree nor Disagree		16.98%	9
4	Disagree		5.66%	3
5	Strongly Disagree		5.66%	3



**7. "The research area of Complexity Science is important beyond the academic community" To what extent do you agree or disagree with this statement?**

			<b>Response Percent</b>	<b>Response Total</b>
1	Strongly Agree		67.92%	36
2	Agree		24.53%	13
3	Neither Agree nor Disagree		3.77%	2
4	Disagree		1.89%	1
5	Strongly Disagree		1.89%	1

8. Complexity Science is currently supported as a standard mode area within EPSRC, with recognised connections to other councils. As a strategic trajectory from Balancing Capability, EPSRC expects this area to reduce as a proportion of the EPSRC research portfolio between now and 2020 (<https://www.epsrc.ac.uk/research/ourportfolio/researchareas/complexity/>). There are several options for evolving the manner in which complexity science is supported. Reflecting on your responses to the previous questions, please rank these measures in order of how effective you think they might be in providing appropriate support to the area of Complexity Science over the next few years, given the need for the area to reduce as a proportion of the EPSRC research portfolio between now and 2020. (1 = most effective among available options).\*\*Drag items on the below list to reorder them, alternatively select the desired position on the list using the drop down box

Item	Total Score <sup>1</sup>	Overall Rank
Retain the area of Complexity Science while increasing emphasis on cross-disciplinary activity.	348	1
Take action to improve collaboration and coordination across the field of Complexity Science	304	2
Encourage applicants to address real world challenges	289	3
Shift emphasis towards training of skills to enable working across discipline boundaries	235	4
Make no changes to the approach taken to support Complexity Science.	219	5
Encourage applicants in this area to shift towards longer, larger grants	192	6
Focus funding in this area on networking and community building activities	177	7
Phase out the discrete research area of Complexity Science and seek to support this activity by embedding it within other themes and activities.	144	8
<sup>1</sup> Score is a weighted calculation. Items ranked first are valued higher than the following ranks, the score is a sum of all weighted rank counts.	answered	53
	skipped	0

#### 10. Do you consider yourself to be a researcher in the area of Complexity Science?

		Response Percent	Response Total
1	Yes		90.20% 46
2	No		9.80% 5