



Engineering and
Physical Sciences
Research Council

Quick Reference

Please note that you must read this full Call document for guidance before submitting your proposal

Responsive Manufacturing

Call type: Invitation for full proposals

Closing date: 12 November 2020 at 16:00

Key Information

Funding available or Maximum/Minimum amount available	EPSRC will provide up to £10 million (Research Council Contribution) to support a number of research projects.
Type of funding	Standard Research Grant
UKRI funder(s) Lead council listed first	EPSRC

Overview

This call is open only to those who were successful at the outline stage of the Responsive Manufacturing call and have been invited to submit a full proposal. The EPSRC Manufacturing the Future Theme will provide up to £10M (Research Council contribution) to support a portfolio of Responsive Manufacturing research projects.

Assessment Process: Invited full proposals will be assessed by postal peer review, followed by assessment at a prioritisation panel, resulting in a rank ordered list. Funding decisions will be made in March 2021.

Key Dates:

Activity	Date
Call Opens for Invited Full Proposals	17 September 2020
Deadline for Full Proposals	16:00 12 November 2020
Prioritisation Panel	February 2021
Funding decision	March 2021

Grant start date (earliest)	From April 2021
-----------------------------	-----------------

Only **invited full proposals** will be accepted to this call. There is no requirement for an institutional statement of support.

Contacts:

- Ms Stephanie Williams, Portfolio Manager, Manufacturing the Future Theme – Stephanie.Williams@epsrc.ukri.org.
- Mr Tochukwu Ajare, Portfolio Manager, Manufacturing the Future Theme, Tochukwu.Ajare@epsrc.ukri.org
- ManufacturingPeerReview@epsrc.ukri.org (Manufacturing the Future Theme central email inbox)

For help and advice on costings and writing your proposal please contact your Research Office in the first instance, allowing sufficient time for your Organisation's submission process.

Any queries regarding the submission of proposals through Je-S should be directed to:

- The Je-S helpdesk (JeSHelp@je-s.ukri.org – 01793 444164).

Please see the Je-S homepage at <https://je-s.rcuk.ac.uk/JeS2WebLoginSite/Login.aspx> for Helpdesk opening hours.



Engineering and
Physical Sciences
Research Council

Responsive Manufacturing

Call type: Invitation for full proposals

Closing date: Closing date: 12 November 2020

Related themes: **Digital economy, Energy, Engineering, Healthcare technologies, ICT, Manufacturing the future, Mathematical sciences, Physical sciences**

Contents of this call document

[Opportunity Summary](#)

[Who can apply](#)

[What we're looking for](#)

[How to apply](#)

[How we will assess your application](#)

[Additional Information](#)

[Supporting Documentation](#)

[Related Content](#)

Opportunity Summary

- **Applications will only be accepted from full proposals that have been invited following a successful outline stage**
- We will provide up to £10M (Research Council contribution) to support a portfolio of Responsive Manufacturing research projects
- Proposals should target any current or future manufacturing system able to respond autonomously to emergent changes or disruption inside or outside the system and so contribute to its resilience and/or sustainability
- Proposals must lie within the remit of the EPSRC Manufacturing the Future theme
- This call uses standard UKRI eligibility
- Applicants who are invited to submit a full proposal will be required to include a User Engagement Strategy as part of the full proposal paperwork
- Submissions to this call **will** count towards the EPSRC Repeatedly Unsuccessful Applicants Policy

Who can apply

Only successful applicants from the Outline stage of the Responsive Manufacturing call may apply.

Standard EPSRC eligibility rules apply: Research grants are open to UK higher education institutions, research council institutes, UKRI-approved independent research organisations and NHS bodies with research capacity.

Read the guidance on institutional eligibility <https://www.ukri.org/funding/how-to-apply/eligibility/>. You can apply if you are resident in the UK and meet at least one of the bullets below:

- are employed at the submitting research organisation at lecturer level or equivalent
- hold a fixed-term contract that extends beyond the duration of the proposed project, and the host research organisation is prepared to give you all the support normal for a permanent employee
- hold an EPSRC, Royal Society or Royal Academy of Engineering fellowship aimed at later career stages
- hold fellowships under other schemes (please contact EPSRC to check eligibility, which is considered on a case-by-case basis).

Holders of postdoctoral level fellowships are not eligible to apply for an EPSRC grant.

If you are currently restricted under the Repeatedly Unsuccessful Applicants Policy, you may submit unlimited outlines but you will only be able to submit one full proposal (as PI or CO-I) during the 12 month restricted period. Outline and full proposals are covered by the EPSRC Resubmissions Policy. Further information about this policy can be found at:

<https://epsrc.ukri.org/index.cfm/funding/applicationprocess/preparing/preparingnewproposals/>.

What we're looking for

Synopsis

'Responsive Manufacturing' is one of the EPSRC Manufacturing the Future (MtF) Theme's new research priorities, emerging from a period of community consultation (see Background section). Discussions with the MtF Strategic Advisory Team (SAT) have drawn together a number of themes from the community consultation, along with ideas from other topics, to form the Responsive Manufacturing priority. This priority concerns manufacturing systems and processes that are able to respond autonomously to change.

More recently, the global crisis arising from COVID-19 has brought attention to the impacts of disruption on manufacturing systems, and highlighted the need for resilient manufacturing systems that can respond to disrupted operating environments.

As part of the MtF Strategy refresh, the theme has adopted Sustainability as a cross cutting priority which should be reflected in all strategic investments.

The aims of this Responsive Manufacturing call are to:

- Support the novel research required to enable responsive manufacturing: processes that self-adjust and self-optimize in real time

- Support research into responsive manufacturing processes with improved efficiency and optimised resource, asset use and interoperability, leading to more sustainable manufacturing systems.
- Develop responsive manufacturing technologies and processes (and/or combinations of technologies and processes) which will enable and form part of resilient manufacturing systems.

For more information about EPSRC's portfolio and strategies, see our website: <https://epsrc.ukri.org/research/ourportfolio/>. Please see the Background section for more information about the call context.

This call is for Standard Research proposals.

Scope

Full proposals should not differ significantly from the associated Outline Proposal. EPSRC reserves the right to reject, without reference to peer review, any proposals where this advice has not been followed.

Proposals should target any current or future manufacturing system that is able to respond autonomously to emergent changes or disruption inside or outside the system and so contribute to its resilience and/or sustainability. Relevant changes could concern, for example: supply chain disruption or feedstock availability; workforce availability; changes in output requirements such as product specifications; or uncertainty or error in one part of the manufacturing system. The main research focus must be **within** the factory or equivalent manufacturing setting; however, the responsive system may respond to changes inside or outside the factory.

To define the core research challenges to be supported by this call, it may be useful to consider the responsive system's capabilities as analogous to those of an organism. The organism's responsiveness is enabled by a nervous system which senses change and conveys information to the brain. The brain receives the information and decides on a response. The response is then communicated to the muscles or organs, which act to respond to the change. By analogy, the development of a particular responsive manufacturing system might require a 'nervous system' of in-line sensors and measurement technology to provide real-time information to the 'brain', which might rely on protocols to support autonomous control. The 'muscles' of the system might include manufacturing technologies which have a modular design, or can handle different materials concurrently.

The focus of the research should be on technologies and processes which would form part of a Responsive Manufacturing system, and/or on the design or operation of such a system. In either case, it must be clear how the research to be conducted supports the vision of a Responsive Manufacturing system, and that consideration has been given to broader systems issues and challenges relating to the research and its impact. To fit within the remit of the EPSRC Manufacturing the Future theme, proposals must focus on fundamental research into the manufacturing technologies, the manufacturing process and/or its design and operation.

Sustainability considerations should be embedded in all projects. The research projects should be compatible with, or help to achieve, manufacturing

technologies, processes and systems that make effective and efficient use of resources, leading to acceptable (even positive) environmental impacts.

A number of broader challenges may also arise when considering the development of responsive manufacturing systems. Research focused mainly on addressing the challenges below may fall outside the remit of the EPSRC Manufacturing the Future theme and is outside the scope of this call. However, applicants are encouraged to consider any broader challenges relevant to their project and to demonstrate in their application that their research vision supports these considerations. Where appropriate, a minor part of the research project may focus on one or more of these broader issues. These include, but are not limited to:

- Digital modelling of processes
- Standards, Regulation and Ethics relating to responsive manufacturing processes, for example where variable feedstocks are used.
- Privacy, trust and security concerns, as well as data handling, for example relating to traceability of products
- The role of human intervention and creativity in a responsive process
- Understanding of manufacturing supply networks
- Business models and management systems for responsive systems
- Sustainability credentials of products made by the responsive process, for example, Life Cycle Analysis of products
- Product design.

Funding Available

The EPSRC Manufacturing the Future Theme will provide up to £10M (Research Council contribution) to support a portfolio of Responsive Manufacturing projects, expected to be up to three years in duration. Grant size is expected to be in line with usual Standard Research grants, and must be within 10% of the total amount indicated at the outline stage. Applicants intending to request a particularly large grant (>£2.5 million) are strongly advised to contact EPSRC in advance of submission to discuss this.

Inclusion of Project Partners is encouraged, although not a formal requirement of this call. All applicants are however encouraged to think more broadly about industrial engagement, including building in plans to engage with a range of relevant manufacturing companies, including SMEs, throughout the project. A User Engagement Strategy describing this approach must be submitted as part of this Full Proposal stage, and the appropriateness of this will be assessed under the Applicant and Partnerships criterion.

Equipment over £10,000 in value (incl. VAT) is not available through this call. Smaller items of equipment (individually under £10,000) should be in the Directly Incurred - Other Costs heading.

For more information on equipment funding, please see:
<https://epsrc.ukri.org/research/facilities/equipment/>

Version 12 August 2020

How to apply

This document relates to the submission of full proposals. For reference, the Outline (stage 1) call document may be found at <https://epsrc.ukri.org/files/funding/calls/2020/responsive-manufacturing-call-document/>.

Stage 2: Submitting a Full Proposal (invited only)

For those successful at the outline stage, the invited full proposals must be received by the deadline of **16:00 12 November 2020**.

Although proposals may be multi-institutional, only one application form should be submitted for each bid. **Joint proposals on separate Je-S forms will not be accepted.**

Full proposals invited following a successful outline stage must have the 'Related Grant' field completed in Je-S. Please use the option 'Successful Outline'.

Guidance on the types of support that may be sought and advice on the completion of the research proposal forms are given on the EPSRC website (<https://www.epsrc.ukri.org/funding/howtoapply/>) which should be consulted when preparing all proposals.

Applicants should ensure they are aware of and comply with any internal institutional deadlines that may be in place. You should prepare and submit your proposal using the Research Councils' Joint electronic Submission (Je-S) System (<https://je-s.rcuk.ac.uk/>).

When adding a new proposal, you should go to documents, select New Document, then select:

- Council 'EPSRC'
- Document type 'Standard Proposal'
- Scheme 'Standard'
- On the Project Details page you should select the 'Responsive Manufacturing Full Proposals – Invite Only' call.

After completing the application:

- You must 'Submit document' which will send your application to your host Organisation's administration
- Your host Organisation's administration is required to complete the submission process. Applicants should allow sufficient time for your Organisation's submission process between submitting your proposal to them and the call closing date

EPSRC must receive your application by 16:00 on **16:00 12 November 2020**.

Guidance on writing an application

After short-listing the outline proposals, we have invited a number of applicants to prepare and submit full proposals. Applicants are advised to consider the

assessment criteria for the full proposal stage of this call and ensure that these criteria are appropriately addressed in the application.

As well as the Joint Electronic Submission (Je-S) Application Form, the following documents must be submitted

Attachment Type	Maximum Page length	Extra Guidance
Case for Support	Eight pages	Comprising up to two A4 sides for a track record, and six A4 sides describing proposed research and its context.
Workplan	One page	Should be illustrated with a simple diagrammatic work plan, such as a Programme Evaluation and Review Technique (PERT) or Gantt chart.
Justification for Resources	Two pages	
CVs	Two pages each	For named and visiting researchers, and researcher co-investigators only.
Project Partner Letters of Support	No page limits	Must be included from all named project partners. Must be on headed paper, and be signed and dated within six months of the proposal submission date.
Additional document	Two pages	A User Engagement Strategy must be included under this attachment type. See guidance below.
Letters of Support	No page limits	Optional: In exceptional circumstances a maximum of three letters can be submitted.
Technical assessment	No page limit	Optional: For the use of a major facility, where applicable.
Proposal Cover Letter	No page limit	Optional: The cover letter can be used to highlight any important information to EPSRC. This attachment type is not seen by reviewers or panel members.

You should attach your documents as pdfs to avoid errors. They should be completed in single-spaced Arial 11 font or similar-sized sans serif typeface

For advice on writing proposals see

<https://epsrc.ukri.org/funding/applicationprocess/preparing/>

Full proposals should not differ significantly from the associated Outline Proposal. EPSRC reserves the right to reject, without reference to peer review, any proposals where this advice has not been followed. The total cost of the full proposal must not differ from the outline proposal cost by more than 10%. Between the outline and full proposal stage it is, however, acceptable to add, remove or modify Project Partners.

EPSRC will not fund a project if it believes that there are ethical concerns that have been overlooked or not appropriately accounted for. All relevant parts of the Ethical Information section must be completed. Further guidance on completing the Je-S form can be found at <https://je-s.rcuk.ac.uk/Handbook/pages/GuidanceonCompletingaStandardG/EthicalInformation.htm>. EPSRC guidance can be found under Additional Information.

User Engagement Strategy

Successful applicants will be required to develop and execute a strategy for engaging with potential users of the research funded in the project (resources for this activity can be requested and must be justified in the application). **An initial version** of this strategy should be submitted as a two-page document as part of this full proposal stage. This should cover the points highlighted below, and will be assessed under the Applicant and Partnerships Criterion. A mandatory Additional Document has been included on the Je-S form for this purpose. This strategy should be reviewed and updated regularly as part of the formal management of the grant.

The strategy should cover:

- how and when potential users have been / will be identified;
- what form the engagement will take;
- what steps will be taken to ensure that outputs of the research are made available to potential users;
- suitable metrics for determining the success of the strategy in delivering value to users.

This requirement has been included in this call to reflect the importance of engaging with manufacturing industries as part of realising the benefits of the fundamental research we support.

How we will assess your application

Assessment Process

This is a two-stage assessment process. Outline proposals have been considered by an independent panel with the necessary expertise to assess the proposals against the outline assessment criteria. Successful outline proposals have been invited to submit a full proposal.

Stage 2: Full Proposals

Invited full proposals will undergo postal peer review. If the reviews are sufficiently supportive, applicants will be invited to submit a response to reviewers. The proposals will be assessed and ranked by a panel based on the reviewers' comments and the applicant response, using the full assessment criteria provided below. The panel will consist of relevant experts from across the scope of the call, and will take place in February 2021. The final outcome will be based on a rank-ordered list compiled by a prioritisation panel. Funding decisions may be expected in March 2021.

Assessment Criteria

Full proposals submitted under this call will be assessed according to the following criteria.

Standard Assessment Criteria

- **Research Quality (Primary Criterion)**

- Relevance to the UK manufacturing research base and potential to provide the UK with unique capability
- The novelty, relationship to the context, timeliness and relevance to identified stakeholders;
- The ambition, adventure, transformative aspects or potential outcomes;
- The suitability of the proposed methodology and the appropriateness of the approach to achieving impact.

(For reviewers: For multi-disciplinary proposals please state which aspects of the proposal you feel qualified to assess)

- **National Importance (Secondary Major Criterion)**

- Evidence of how the proposed research contributes to:
 - Maintaining the health of other research disciplines,
 - Addressing key UK societal challenges
 - Current or future UK economic success and/or enables future development of key emerging industry(ies);
- Meets national strategic needs by establishing or maintaining a unique world leading research activity (including niche capability areas)
- Fits with and complements other UK research already funded in the area or related areas, including the relationship to the EPSRC portfolio, [Research Area strategies](#) and [Delivery Plan](#).

- **Applicant and Partnerships (Secondary Criterion):**

- Ability to deliver the proposed project,
 - Appropriateness of the track record of the applicant(s)
 - Balance of skills of project team, including collaborators
- Appropriateness of the User Engagement Strategy and any resources requested for it.

- **Resources and Management (Secondary Criterion):**

- The effectiveness of the proposed planning and management arrangements
- Any equipment requested, or the viability of the arrangements described to access equipment needed for this project, and particularly on any university or third-party contribution;
- The appropriateness and justification of the requested resources

- Include any resources requested for activities to either increase impact, for public engagement or to support responsible innovation.

Call Specific Criteria

- **Fit to call (Secondary Criterion):**
 - Alignment of the research programme to the call scope

Feedback

Reviewers' reports will be made available to all applicants who are invited to the second stage and submit a full proposal. A rank ordered list from the full proposal prioritisation panel will be available shortly after the panel on <https://gow.epsrc.ukri.org/>. The prioritisation panel may provide specific feedback if deemed necessary, but this will not be given as standard.

Nominating Reviewers

As part of the application process you will be invited to nominate up to three potential reviewers who you feel have the expertise to assess your proposal. Please ensure that any nominations meet the EPSRC Policy on conflicts of interest.

For more information about the reviewer selection process please see the related content links.

Guidance for reviewers

When completing your assessment please use the section marked 'Call Specific Criteria' to address the Fit to Call criterion.

Information about the EPSRC peer review process and guidance for reviewers can be found at: <https://epsrc.ukri.org/funding/assessmentprocess/review/>

Guidance for reviewing standard grants can be found here:

<https://epsrc.ukri.org/funding/assessmentprocess/review/formsandguidancenotes/standardgrants/>

Additional Information

Background

The EPSRC Manufacturing the Future Theme (MtF) has recently refreshed its research priorities, with input from numerous members of the Manufacturing research and innovation community. The topic of 'Responsive Manufacturing' has emerged as one of the Theme's new research priorities.

In 2018 MtF held a strategic retreat (entitled 'Manufacturing Futures') that explored the future manufacturing research (and innovation) space, supporting the development of new research (and innovation) themes that might form the basis for future EPSRC activities. A number of the themes which emerged were further explored and developed at the MtF Regional Meetings in 2018 and 2019 with a range of manufacturing researchers. Further input into the Strategy

Refresh was sought at a Research Priorities Workshop in October 2019. Reports of the Retreat, Regional Meetings and Research Priorities Workshop may be found respectively at <https://epsrc.ukri.org/files/newsevents/manufacturing-futures-retreat-2018-report/>;
<https://epsrc.ukri.org/newsevents/pubs/mtfregionalmeetingsreport201819/>;
<https://epsrc.ukri.org/files/newsevents/report-of-the-manufacturing-the-future-research-priorities-workshop/>.

The emerging topics were subsequently refined, with significant input from the MtF Strategic Advisory Team (SAT), and from the MtF Early Career Forum.

One topic to emerge from the original Retreat was 'Disruption Resilient Manufacturing'. This captured the idea of a future manufacturing system that could learn from disruption, and could repair and reconfigure itself, eventually finding a new balance point for optimal operation. Such a system would be trusted to cope with disruption to infrastructure or resources, and could even use disruption to find an improved way of operating.

'Invisible Manufacturing' was another topic from the 2018 Retreat. The 'Invisible' system would self-optimize to provide a user-specified product, while the mechanisms behind the optimisation were 'invisible' to the user. As well as ensuring production of the right products at the right time, place, cost and quality, this future system could self-optimize for different input materials, supporting waste reduction, and also self-optimize with respect to other sustainability criteria.

Subsequent discussions with the MtF Strategic Advisory Team (SAT) have drawn out themes from the above starting points, along with ideas from other topics, to form the Responsive Manufacturing Priority which is the subject of this call.

Most recently, the global crisis arising from COVID-19 has brought attention to the impacts of supply chain and workforce-related disruption on manufacturing systems, and highlighted the need for resilient manufacturing systems that can respond to disrupted operating environments.

As part of the MtF Strategy refresh, the theme has adopted Sustainability as a cross cutting priority which should be reflected in all strategic investments. Additionally, in May 2020 UKRI launched its first environmental sustainability strategy, setting out its ambition to achieve 'net-zero' for our carbon emissions. By 2025, environmental sustainability will have been embedded across all our investment decisions.

Building on the above thinking, the aims of this Responsive Manufacturing call are to:

- Support the novel research required to enable responsive manufacturing: processes that self-adjust and self-optimize in real time
- Support research into responsive manufacturing processes with improved efficiency and optimised resource, asset use and interoperability, leading to more sustainable manufacturing systems.
- Develop responsive manufacturing technologies and processes (and/or combinations of technologies and processes) which will enable and form part of resilient manufacturing systems.

Supporting Documentation

Related Content

- [Resubmissions](#)
- [Repeatedly unsuccessful applications](#)
- [Equipment](#)
- [Use of animals](#)
- [Responsible research and innovation](#)
- [Ethical considerations](#)
- [Equality, Diversity and Inclusion](#)
- [Reviewer selection](#)
- [Conflicts of interest](#)
- [DORA](#)

An Equality Impact Assessment for this activity may be found at <https://epsrc.ukri.org/files/funding/calls/2020/responsive-manufacturing-call-eia/>, and the call for outlines is at <https://epsrc.ukri.org/files/funding/calls/2020/responsive-manufacturing-call-document/>.

Change log

Name	Date	Version	Change
Stephanie Williams	8/9/20	1	Original version of Full Proposal stage call document. Outline stage call document may be found on the call webpage.