The EIC – Generating Social and Economic Impact from Deep Science and Disruptive Technologies

Briefing Document for EIC Pilot Advisory Board Prepared by the Pathfinder Working Group

1. Background and Context:

The European Innovation Council (EIC) has been formed with the aim of mirroring for European Innovation, the outstanding achievement of the European Research Council (ERC) in establishing Europe's reputation as a global leader in research. Through this strategic initiative, the European Commission aims to significantly improve the global competitiveness of European companies in the translation of high-quality research outputs through to impactful products and services. Unless Europe improves its innovation processes – especially at producing disruptive, game-changing innovations – its societies will be reduced to consumers of technology invented elsewhere. This has become a systemic problem across Europe, once the innovation centre of the world, despite the wealth of intellectual capital and resources, especially in the European universities and Research and Technology Organisations. The EIC therefore represents a unique opportunity for Europe to dramatically change this position by *"supporting visionary and game- changing innovators, researchers, entrepreneurs and investors; directing resources into high-impact ideas, ventures and investments; and for our industries and new businesses to lead on major innovation opportunities emanating from deep-tech in the coming years".* [1]

To drive this change, the EIC brings together two pre-existing schemes, ***FET Open/Proactive (now Pathfinder***) and ***SME (now Accelerator)***, to integrate the entire journey from early-stage research to the market within a single entity, thereby providing the fundamental basis for more effective management of the interface between these critical activities. This document focuses on ***Pathfinder***, and in particular, how its existing components can be mobilised and adapted to optimise its contribution to the EIC mission (see Annex A).

The mandate of the Pathfinder Working Group of the EIC Advisory Board (EICAB) is to propose strategies that will;

- Leverage experience and knowhow from the successful Horizon 2020 FETopen[2] (bottom-up) and FETproactive[3] (top-down) schemes into Pathfinder;
- Produce a mechanism for theme selection that draws on multiple inputs from knowledgeable sources, and provides early intelligence of emerging hot topics (e.g. through cluster detection in bottom-up research activity, analysis of Twitter and other sources);
- Create an effective framework to drive enhanced mobility of game-changing ideas/projects between the Pathfinder and Accelerator components of the EIC, through to market exploitation and socio-economic impact.

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2. Solving Europe's Innovation Paradox and Expertise Challenge

Europe's rich research tradition gives rise to many high potential ideas, and while this early stage work and proof of concept activity may occur in Europe, commercialisation and exploitation all too often happens elsewhere. This European **Innovation Paradox** is the primary reason for the creation of the EIC. The paradox exists for a number of reasons: (i) lack of risk-taking by European researchers either through creating their own start-ups or extending their remit beyond research into the technology transfer process required to bring their ideas to the market; (ii) lack of sufficient venture capital and investors interested in high-risk early stage investments; and, (iii) lack of an appropriate support framework to bring ideas to the market, especially in the early innovation stages where the risks are still high.

These issues are inter-related. In Europe, the research and innovation/business creation communities are largely separate, due to their hitherto siloed nature, and the consequential weakness of links between them.[4] Academic researchers develop their careers by publishing papers and developing a strong h-index, with little incentive to bring their ideas further towards societal/economic impact. In parallel, this lack of a closely integrated research and entrepreneurship culture means that innovators and investors often do not appreciate the full spectrum of risks and challenges associated with implementing a particular technology in the marketplace. The **Expertise Challenge** for Europe is therefore to build a community of people whose perspectives encompass the research and innovation continuum, and overcome this crucial intellectual divide.

The EIC's future success will depend on a clear understanding of how it can address the Innovation Paradox and the Expertise Challenge, and in particular how the existing portfolio of measures can be re-organised to create a much more integrated, informed and effective framework to support researchers and innovators.

3. The EIC Pathfinder: Boosting technology innovation effectiveness

Boosting innovation effectiveness is a complex and demanding objective. Science-driven and technology-based innovation (aka deep-tech) encompasses the entire journey from fundamental research, development of emerging technologies and services, de-risking, scale up, market intelligence, investment strategies and social engagement. Two aspects are particularly critical in this process:

- The first is to have the capacity to pick up early signals from developments in science that point at radically new and untried technological possibilities. The EIC Pathfinder is unique for its science-driven technology focus, supporting interdisciplinary collaborations to turn high-risk ideas into first proof-of-technology concepts. A well-resourced bottom-up scheme open to any radical ideas that could lead to future game-changing technological breakthroughs is essential for broad exploration of these new possibilities. A parallel top-down scheme complements this by building critical mass and demonstrating the full potential of a new technology under targeted themes. Together, these two schemes provide a powerful complementary effort that creates the reference points of expertise, knowledge and prototypes for emerging technological paradigms in the deep-tech innovation landscape. In line with the high-risk orientation of the Pathfinder, both schemes (bottom-up and top-down) target TRLs 1-4 and are mostly based on collaborative (consortium based) approaches, as experience shows that novelty originates usually at the intersection of existing disciplines. Involvement of research-intensive SMEs proposing novel visionary ideas of the kind targeted by the Pathfinder is already occurring, but should be particularly encouraged in line with our overall ambition to bring innovative technologies to the market.

- The second critical point is to find a way of **promoting early technology ideas from the lab to the fab and to the market**. Bridging the valley of death, such a scheme would provide the missing link between early technology development and market breakthrough, a process that is known to be particularly difficult, often long and non-linear. It requires a new kind of interface between research and early stage innovation, combining deep knowledge of risks and opportunities from *both the research AND the innovation perspectives*. Effective migration across this interface cannot happen without close

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engagement between experts who can match high potential research outcomes with emerging market needs, and guide projects through to market impact (societal and economic) via a suite of effective and flexible support measures designed to dramatically improve the efficiency of the translation process.

Concerning the transition to innovation activities, experience with the current T2I scheme shows that support for two types of projects is optimum, as bridging between early deep tech results (TRL 4) and market creation opportunities (TRL 6) is a complex challenge with no 'one-size-fits-all' solution.

The EIC Pathfinder WG therefore recommends that T2I should support two tracks:

⇨ **A 'Transition to Technology'** track to support advancement of Pathfinder project ideas/projects up to TRL 4-6. This will remain mainly a collaborative scheme that facilitates new partners if needed to provide essential capabilities for advancing the science and technology towards a viable demonstrator shown to function in the intended field of use.

⇨ **A 'Transition to Market'** track, for projects led by an SME/Start-up with a strategic market interest in the results, either as single partner or in a small collaboration. The outcome will be significantly de-risked technologies that are much more attractive for equity investment through Accelerator or other sources.

These schemes are not meant to establish an obligatory 'innovation pipeline' that must be followed from scheme to scheme, linearly advancing along an inflexible, ponderous process too slow to be competitive. Rather the portfolio of support schemes should be employed in a creative manner that facilitates flexibility and multiple pathways from Pathfinder to Accelerator and the market. This ethos will be crucial to drive the non-linear innovation dynamics essential for the future success of the EIC.

Concerning the **EIC Innovation Launchpad**, we recommend its mode of use be changed, from an instrument restricted to previous Pathfinder results to a simple mechanism to attract deep-tech visions from any relevant programme, notably projects funded by the ERC, EIT or Horizon Europe Pillar 2 actions[5]. Hence, Launchpad remains focused on preparing the initial steps from research to innovation, based on early-stage results. In particular, it provides a resource for preparing proposals to launch a successful T2I action. Launchpad projects should result in a clear plan and proof-of-ambition that turns an exciting research idea into a convincing innovation plan. Similarly, we recommend that the Launchpad also be used to prepare the ground for T2I activities via a co-creation process driven by a market opportunity that leverages a breakthrough technology taken from a current project, or from a research repository.

Role of Programme Managers

The Pathfinder, together with the Accelerator, must establish a dynamic process that drives ideas to impact through effective implementation of the strategic support framework (see Figure 1). Critical to success of the EIC will be the recruitment of "Programme Managers" (PMs). These are mission critical people recruited from the academic and business communities on term contracts (like DARPA programme managers) on the basis of their ability to appreciate the importance of the full pathway from research to impact, and particularly the interface between research and innovation. PMs must be proactive, scanning project portfolios for emerging technologies and aspects of projects that appear to have game-changing market potential, and linking these with appropriate resources that can quickly transform research ideas into business opportunities.

The PMs will interact closely with the EIC Project Officers, who are responsible for the monitoring of the administrative and implementation aspects of the EIC projects. Clearly, a successful EIC will be based on a common ethos that recognises the importance of the research and innovation continuum, from the strategic Advisory Board Level, to practical implementation through similarly motivated PMs and Project Officers. The key is to exploit the clever incorporation of FET and SME actions within the EIC, by ensuring the Accelerator and Pathfinder management teams have regular opportunities to meet and exchange experiences, share ideas, and get to know the support network more broadly. For example, Pathfinder project officers can access this network to discuss ideas/aspects of projects that appear to have game-

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[5] *Other programmes, e.g., national ones could also be plugged into the Pathfinder through this mechanism, after it has been checked that they conform with the high-risk, high-impact results that Pathfinder is focused on.*

changing market potential, while Accelerator project officers equally can exploit the broader expertise network for informed opinion on research that may be necessary to clear a technological obstacle on the pathway to the market.

We envisage an important role for PMs, to ensure these support schemes work seamlessly together. In particular, PMs should;

- **Identify and Implement Top-Down Topics:** For the lower TRLs (1-4) the EIC workprogamme should include roadmaps for top-down topics funded via annual calls. The PMs will help to define top-down Pathfinder initiatives to develop new deep-tech areas that require critical mass and a level of coordination within an evolving project portfolio. They will oversee a completely new and critically important process through which researchers, innovators, investors and other actors from across the whole EIC spectrum will **co-create a topic selection framework together with an implementation roadmap**. Through this new process, the identification of high potential project outcomes and ideas will reflect input from across the research and innovation spectrum, and will continually revisited and re-optimised. The PMs will pro-actively manage the related portfolios and communities, refine or re-orient objectives, identify emerging hot topics, and harvest and nurture high-potential innovations (e.g., through the Pathfinder T2I). The process of topic selection will build on early signals from science and technology research, portfolio analysis (including Pathfinder, ERC, EIT and comparable national programmes), and take into account political priorities (e.g., *Green Deal*, *A New Digital World*).[6] A mechanism for oversight and endorsement of PM decisions will be required, guided by input from the EICAB.
- **Adopt a Pro-Active Role in Managing Project Flow towards the Market:** To encourage this, we recommend that PMs have discretion to top-up an ongoing project grant to a limited extent (up to 50 K€) to support a development of a business case from a high-potential project outcome (e.g. from
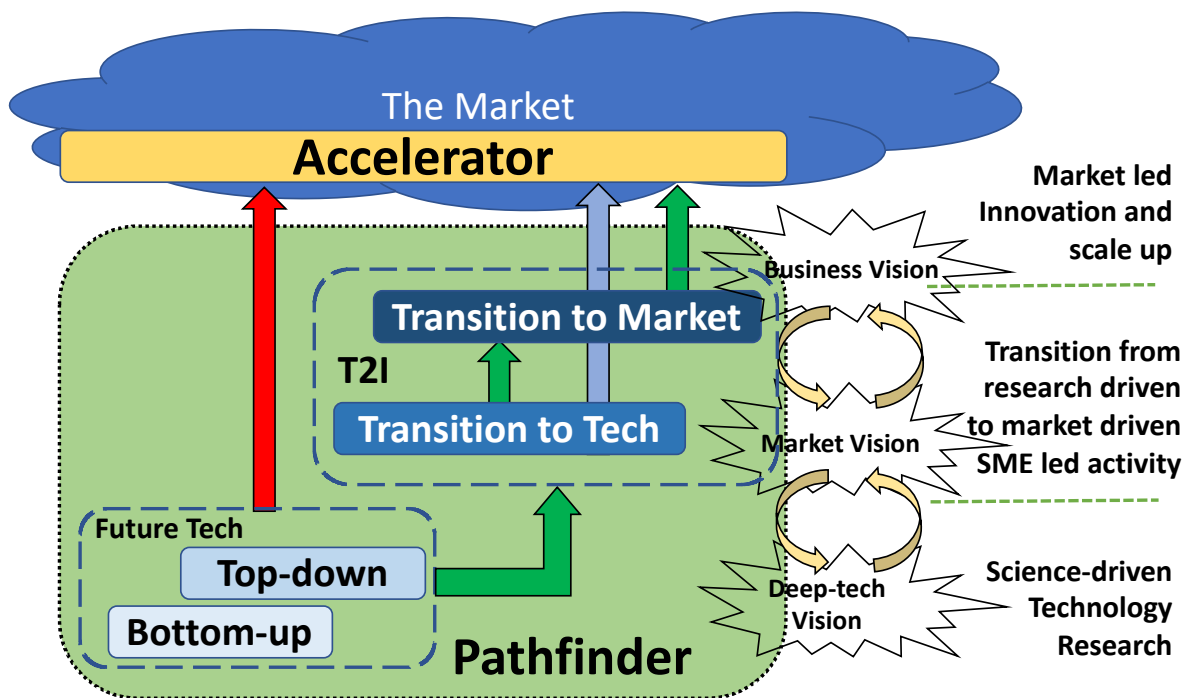

Figure 1: Representation of how Pathfinder components work together and with Accelerator to bring Science Driven-Technology Focused Research through to Market Led Innovation and Scale-up. Selected High-Potential Outputs from 'Future-Tech' Top-Down and Bottom-Up projects pass to T2I for further development (Transition to Tech) or conversion to market led, business driven activity (Transition to Market), depending on the market readiness of the technology. At all stages, alternative fast-track options will be available to provide a more rapid route to market, for example using 'Launchpad' type funding in a flexible, discretionary manner. The remit for T2I should be broadened to include high-potential projects from other sources (ERC, EIT, Horizon Europe Pillar 2 actions.) to capitalise on its positioning as a flexible, responsive gateway to the market.

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[6] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en; https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age_en

Pathfinder bottom-up, top-down or technology focused T2I). This provides the PM with the capability to provide high-potential ideas with a ***fast-track entry ticket*** either to the market-oriented T2I, or directly to the EIC Accelerator. The details of this 'fast track' will need to be developed, so that it can meet the goal of providing a clear gain in time, effort needed and success rate to access 'downstream' EIC support.

Enhancing Agility in Pathfinder Support Measures

Most research funding measures cannot respond to a rapidly emerging crisis (like the COVID-19 pandemic)[7] as their operational model is based on competitive calls that are published well in advance, and subject to approval processes that are embedded within a legal operational framework. Top-down themes provide a mechanism for agencies to focus the efforts of researchers and entrepreneurs on solving emerging societal needs and addressing critical technology gaps. However, to be effective, the themes must map accurately to real societal and industrial needs/market opportunities, and match the dynamics of the issues/opportunities. Previous experience from FET Proactive shows that topics change from year to year, and the same will apply to Pathfinder Top-Down. While this does establish a significant degree of responsiveness to emerging challenges/opportunities within Pathfinder, an additional level of agility could be built-in by reserving part of the T2I budget, specifically to resource a very rapid response to particularly dynamic scenarios arising, for example, from societal emergencies like COVID-19. The T2I scheme is one of the few support mechanisms in the entire EU research funding portfolio that can be used to mobilise a focused effort involving collaboration between research teams and innovation-oriented SMEs in response to such rapidly emerging societal needs.

Pathfinder should also address multiple ways to exploit its results, not just as a logical progression from idea to market, but as a dynamic recombination of results across the programme with emerging needs, market opportunities and IP or capabilities from downstream actors. We therefore recommend that all results, even those for which no immediate market potential is recognised, are kept into a technology/expertise repository, to create a continuously growing resource for market ideas that may emerge after projects have been completed. The value of these results, and the associated expertise (i.e., the teams that developed them), might become more evident in the future, or become a building block for a new technology, in combination with other results or IP from elsewhere. **This concept of co-creation links market ideas and down-stream IP with active projects, or technologies in the expertise/technology repository.** The team behind these market ideas could involve one or more, or none of the original project partners. The need for a flexible IP framework is critically important to ensure that no barriers to exploitation are created. Consideration needs to be given to maintenance of IP and sharing/combining IP from different sources, to strengthen the overall business offering.

Conclusions

The EIC, through close integration of Pathfinder and Accelerator, has the potential not only to generate game-changing technologies and services, but to create a new, refreshingly dynamic and agile model for the entire innovation process, capitalising on the emergence of rapid prototyping technologies, exploiting the strengths of European diversity and creating a portfolio of flexible tools fit for 21st Century innovation. We are already witnessing a global appreciation of the need to dramatically reduce the timescale for translation of research knowledge into societal impact, driven by the urgency of the COVID-19 pandemic. Right now, Europe has a tremendous opportunity to implement a much more effective innovation process, based on close cooperation between well-resourced Pathfinder and Accelerator programmes, and incorporating flexible and well-thought out interfacial measures. In particular, it is vital that the critical role of Pathfinder is recognised, both within the EIC (as an integrated research dimension) and as a mechanism for facilitating transfer of research ideas between the ERC and the EIC.

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[7] Fundamental research Programmes are not by their nature able to respond dynamically to a societal crisis or market opportunity. This is not a flaw or a weakness, it simply reflects the nature of fundamental research, which is critically important for building the deep-knowledge foundation upon which future societal advances depend. Such research must continue to be strongly supported (where would the global response to COVID-19 be without the depth of pre-existing relevant knowledge generated through such measures?)

Finally, we hope this document provides some useful content for moving our thoughts forward as co-members of the EICAB, so we can constructively address challenges and create the innovative framework that will achieve our critically important objectives for Europe. It is essential that the EIC budget enables the Pathfinder and Accelerator to act together in an appropriately balanced partnership, in order to create the integrated research and innovation culture that is the key to raising our global competitiveness.

Recommendations

1. The Pathfinder Scheme core components (Bottom-Up, Top-Down) must have a significant budget to support the necessary level of research activity that will ensure a continuous, strong supply of high-potential technologies and ideas into the innovation-to-market pathway.
2. Involvement of research-intensive SMEs proposing novel visionary ideas of the kind targeted by the Pathfinder should be particularly encouraged in line with our overall ambition to bring innovative technologies to the market.
3. The remit of the T2I scheme should be broadened from its current link with Pathfinder projects to encompass high-potential ideas and technologies from other sources (ERC, EIT, Pillar 2 Actions…), and provide a vibrant flow of projects to the Accelerator via two tracks; Transition to Technology and Transition to Market.
4. A mechanism should be considered (based on T2I) to stimulate radical thinking around finding solutions to societal needs, that matches game-changing technologies from existing projects or project repositories, with deep market knowledge and business creation opportunities. This could also provide a level of agility in decision making beyond that possible via Top-Down calls, to meet exceptional societal demands/business opportunities.
5. Recruitment of Programme Managers is essential due to their critically important responsibility for implementing the support framework in an agile and dynamic manner. Ideal profiles for these people should be discussed and agreed.
6. An expertise resource that spans the full spectrum from deep-science through to market knowledge must be built, to include researchers, entrepreneurs, investors, and people from SMEs and large corporations. This resource will be essential for the delivery of a successful Pathfinder, and EIC at Advisory Board level, project officers, mentors, reviewers etc. Encourage mixing of these experts at all levels through targeted events.
7. A 'can do' approach to IP must be implemented that facilitates flexible models for licencing IP, sharing IP, and removing IP barriers to exploitation, to underpin a dynamic moulding of new business ideas with patented technologies, e.g.; at Innovation Marts/Fairs, see below.
8. An annual *deep-science & technology MEETs market needs & opportunities* 'mart/fair' should be organised that brings entrepreneurs, innovators and researchers together with EIC PMs, to drive deal-making and catalyse the transfer of ideas to markets.
9. The mode of use of Launchpad should be changed so that it can be applied in a more flexible manner to connect selected high-potential research outputs from Pathfinder (e.g. through PMs) and other Horizon Europe sources with emerging business opportunities, and thereby broaden to flow of ideas the EIC can guide to the market. Its remit should include proposals driven by a market opportunity that leverages a breakthrough technology taken from a current project, or from a research repository.

Annex A: The Existing Pathfinder 'Toolbox'

Currently within the EIC Pathfinder portfolio we have the following components[8];

- ***Open (Bottom-up)*** – calls are open (not thematic) providing a unique tool that can support unconventional ideas and combinations of co-applicants. Focused on science-driven technological research, high risk/high gain; TRL1->TRL3-4 (experimental proof of concept)
- ***Proactive (Top-Down)*** – calls are thematic, with the themes changing to reflect the emergence of new concepts in emerging technologies and their potential societal/economic impact. Larger in scale than Open, and with more participation by industry partners, particularly high-tech SMEs, although this is not a specific requirement of the programme; TRL2->TRL4 (technology validated in the lab).

Along with these, there are two additional tools designed to transform high potential research outcomes emerging from Open and Proactive projects into innovation focused activities. These are;

- **Pathfinder Launchpad (18 months, €100K): "**Proposals can include activities with, for instance, partners for technology transfer, licence-takers, investors and other sources of financing, societal organisations or potential end-users".
- Pathfinder Transition to Innovation T2I: (24 Months, €2M) "…Proposals must build on ongoing or completed FET Open or Proactive projects to turn promising results from FET-funded projects into genuine technological or societal breakthrough and disruptive innovations".

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[8] Source: Horizon 2020 Work-Programme 2018-2020 "Towards the next Framework Programme for Research and Innovation: Enhanced European Innovation Council (EIC) pilot, (European Commission Decision C(2019)4575 of 2 July 2019)