

Institution: University of Chester		
Unit of Assessment: 10 Mathematical Sciences		
Title of case study: Expert Advice to Major Funding Agencies Internationally		
Period when the underpinning research was undertaken: 2000 – 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Neville J Ford	Role(s) (e.g. job title): Professor	Period(s) employed by submitting HEI: 1986 – ongoing
Period when the claimed impact occurred: 2014 – 2020		
Is this case study continued from a case study submitted in 2014? N		

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

This impact case study concerns the impact of FORD as an expert providing advice to a range of international funding agencies. This has enabled the funders to enhance the effectiveness of funding decisions and to promote maximum impact to meet their objectives to support excellent science and its impact in health, engineering, the environment, the economy, and in the development of future excellent scientists. Funding Agencies include European Commission and the Research Executive Agency (REA), the European Research Council, European Science Foundation, the La Caixa Foundation, the National Center of Science and Technology Evaluation, Kazakhstan; National Science Centre, Poland; the Central Finance and Contracting Agency (CFCA), Latvia; UEFISCDI, Romania; Czech Science Foundation.

2. Underpinning research (indicative maximum 500 words)

Ford is Pro Vice Chancellor (Research and Innovation) at the University, having been a member of academic staff since 1986 and having been submitted to all RAE/REF exercises since 1991. He was first appointed as an expert and vice chair under Horizon 2020 and then listed in an EU directory of experts available to international funding agencies. Funders require experts who have experience of undertaking and managing significant interdisciplinary research programmes and who are able to give objective advice on the likelihood of successful and impactful outcomes of proposed research activities that meet the funder's own objectives. Appointment as an Expert under H2020 is based upon the Experts' database held on the Funding and Tenders Portal within the Single Electronic Data Interchange Area (SEDIA). Here, potential experts must provide details of recent research outputs and previous relevant experience. On the basis of these records, potential experts are identified by Research Executive Agency (REA) staff who manage H2020 and placed on a reserve list in anticipation of the closure of a particular call for proposals. When the call is closed, a careful matching of expertise against specific applications received leads to the confirmation of those experts who have the appropriate research expertise to serve as experts for that evaluation. The evaluations are undertaken using the experts' detailed judgements, drawing specifically upon their research results and experience, to provide advice to the REA and to assist in the final prioritisation of proposals. The specific work undertaken for the REA is under a non-disclosure confidentiality agreement. With the expert's agreement, detail of expertise used by REA is shared with other funding agencies, who seek to use the same pool of experts, which results in wider reach of these activities with the extensive list of national and international funders and foundations listed.

The detail of the H2020 process has been described in the following way:

Experts are appointed by the European Commission and selected on the basis of their profiles in the central EU expert data base. Registration is therefore no guarantee for being appointed an expert. To qualify as an expert, the main focus is on the experts' CVs and fields of research expertise in order to make the best match with the specific topics in Horizon 2020. Excellence within the topics outlined in Horizon 2020 framework programmes will therefore be an advantage. Due to the structure of the framework programme, it is expected that beyond excellence, one of

the evaluation criteria will be on the degree of interdisciplinarity in the applications. Experience with interdisciplinary collaborations and research initiatives will therefore be an advantage and will expectedly be of particular interest to the European Commission and in the formation of the evaluation panels. [7]

In the current case, specific areas of research expertise relevant to the appointment are the mathematical modelling and simulation of problems from the life sciences (see research references [1], [2] and [3]), engineering (references [4] and [5]), earth sciences (reference [6]), immunology (reference [3]) and ecology (reference [1]), numerical and analytical approaches to solution and stability of differential and integral equations, and the analysis of discrete systems (references [4] and [5]). These represent significant areas of activity for FORD and the wider research group at Chester, and the evaluation reports draw directly on the Unit's research. FORD undertook the underlying research between 2000 and 2020. FORD has met the conditions of REF Category A at this institution in every RAE/REF exercise from 1991 to the present.

Ford's own research experience, including experience as a PI, as an applicant for funding, as a manager of wider research programmes, and as a panel member or chair, lies at the heart of the evaluation process and forms the basis of all judgements made and advice provided. The evaluation requires a detailed judgement of the scientific and technological merit of each proposal, the appropriateness of the research objectives, the relationship of the project to the current state of the art and the quality and relevance of the research methodology. The profile of the applicants and co-investigators is evaluated in detail, including the quality and impact of previous research results and the likelihood that working on this particular fellowship will lead to new and useful results. The detailed project work plan is assessed, as well as the dissemination and impact strategy alongside arrangements for outreach activities to stimulate wide public interest and engagement with current scientific research. Specific attention is given to the potential impact on European Science and European Competitiveness should the proposal be funded, since the desire for impact on the economy, competitiveness and the supply of well-qualified and excellent scientists is central to the funding objectives and hence to the evaluations. Specific research results of the researcher directly influence the judgement of the scientific merit of the proposal; experience in undertaking similar projects underpins the assessment of methodology, feasibility and risk; knowledge gained from collaborative research links with relevant academic and user communities provides the foundation for assessment of the quality of the researcher, the benefit of knowledge transfer, and the impact of the research on European excellence and competitiveness. Therefore, both the appointment to the role, and the specific advice given are based on the unit's research and drew materially and distinctly upon it.

3. References to the research (indicative maximum of six references)

- [1] Ford, Neville J., Lumb, Patricia M., Ekaka-a, Enu, Mathematical modelling of plant species interactions in a harsh climate JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS 234, pp. 2732-2744, 10.1016/j.cam.2010.01.025, 2010.
- [2] Lima, Pedro M., Ford, Neville J., Lumb, Patricia M. Computational methods for a mathematical model of propagation of nerve impulses in myelinated axons, APPLIED NUMERICAL MATHEMATICS 85, pp. 38–53, 1016/j.apnum.2014.06.0046.004, 2014.
- [3] Ludewig, B, Krebs, P, Junt, T, Metters, H, Ford, NJ, Anderson, RM, Bocharov, G, Determining control parameters for dendritic cell-cytotoxic T lymphocyte interaction, EUROPEAN JOURNAL OF IMMUNOLOGY 34, pp. 2407-2418, 10.1002/eji.200425085, 2004.
- [4] Diethelm, K, Ford, NJ, Freed, AD, Luchko, Y, Algorithms for the fractional calculus: A selection of numerical methods, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 194, pp. 743-773, 10.1016/j.cma.2004.06.006, 2005.
- [5] Ferrás, L. L., Ford, N. J., Morgado, M. L., Rebelo, M., McKinley, G. H. & Nóbrega, J. M., Theoretical and numerical analysis of unsteady fractional viscoelastic flows in simple

geometries. COMPUTERS AND FLUIDS 174, pp. 14-33, 10.1016/j.compfluid.2018.07.004, 2018.

[6] Ford, JM, Ford, NJ, Wheeler, J, Simulation of grain-boundary diffusion creep: analysis of some new numerical techniques, PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON, SERIES A - MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES 460, pp. 2395-2413, 10.1098/rspa.2004.1287, 2004.

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

The impact of this work is to enable national and international funding agencies to improve the quality of their funding decisions to support excellent science and its impact in health, engineering, the environment, the economy, and in the development of future excellent scientists. The impact has wide reach both geographically and sectorially and its significance can be judged through the detailed evaluations of the funding schemes described here. Funding Agencies included within this impact comprise the European Commission and the Research Executive Agency (REA), the European Research Council, the European Science Foundation, the La Caixa Foundation, the National Center of Science and Technology Evaluation, Kazakhstan; the National Science Centre, Poland; the Central Finance and Contracting Agency (CFCA), Latvia; UEFISCDI, Romania; and the Czech Science Foundation.

Horizon 2020 People programme

Under Horizon 2020 *People* programme Ford contributed both as an expert and vice-chair in making funding decisions for Marie Skłodowska Curie (MSCA) Individual Fellowships. The specific activity in this and other schemes described here is conducted under a non-disclosure agreement and therefore the references given are to material that is in the public domain.

Marie Curie Individual Fellowships add to research excellence in both the public and private sectors in EU Member States and associated countries, due to the sharing and application of new knowledge transferred and developed by highly qualified researchers embedded in the European research effort. They have a particular emphasis on countering the European brain drain (where successful European researchers find it more attractive to pursue research careers outside Europe), and allow the transfer of knowledge that the researchers have already acquired, as well as the development of lasting co-operation with the scientific and/or industrial environment of the country from which they have moved. A recent evaluation report adds:

MSCA performs well in relation to cross-cutting objectives such as gender balance, societal challenges, Responsible Research and Innovation (RRI) and open access. The general openness of and bottom-up approach taken by MSCA has allowed a large majority of institutions to train and upgrade the skills of a new generation of researchers able to tackle a broad range of current or expected societal challenges. Moreover, MSCA funding addresses societal challenges to a significant extent, above the Horizon 2020 average and well ahead of the other areas in the excellence pillar. MSCA has performed strongly in relation to gender equality. [8]

One example of the relationship between MSCA and excellent research is that by 2018, nine Nobel Prize winners had been MSCA Fellows. This is an indication of the relevance of the MSCA to the achievement of major impact. While individual experts work on a subset of the total pool of projects, all the evaluation outcomes contribute to the final funding decisions (and, indeed, to the size of the overall funding allocation available) and therefore the individual expert makes an indirect contribution to all funding decisions as well as the direct contribution to specific outcomes.

FET Open Research and Innovation actions

Under Horizon 2020 FET Open Research and Innovation Actions, Ford served as a vice chair in making funding decisions. 'FET Open, now part of the EIC Pathfinder pilot, supports the early-stages of the science and technology research and innovation around new ideas towards radically new future technologies.' The economic and societal impact of the funded projects has been evaluated in a recent (2018) publication. The following extract is drawn from the executive summary of that report [9].

Impact case study (REF3)

- *FET projects have relevant impacts on the economy....*
- *The number of patent applications also demonstrates the potential economic impact of FET projects. A quarter of the analysed FET projects reported at least one patent application based on FET results.*
- *12 percent of FET projects led to the founding of a spin-off company. Again, a remarkably high figure when comparing this with experiences in academia and other public research funding programmes.*
- *FET researchers are very active in communicating their results to industry: 83 percent of the respondents to our survey said that they had contacts with industry in the context of their FET research....*
- *FET projects have relevant impacts on society. As FET researchers still define themselves as being part of a technology development community rather than a community solving societal challenges, we did not expect a high awareness of societal impacts in our survey. However, contrary to our expectations, we found a relatively high share (17 percent) of researchers reporting societal impacts of their FET projects: Nine percent said that their research in FET contributed to tackling Europe's grand challenges and eight percent reported "other societal impacts".*
- *According to our survey, there are other societal impacts in the areas of technology assessment, mobility, healthcare, regulation, education, air quality and others.*

La Caixa Foundation Health Research

Ford served as an evaluator for the La Caixa Foundation, working on the modelling aspects of proposals in Health Research. The programme is described in the following way by the La Caixa Foundation:

One of the main priorities of the "la Caixa" Foundation is to consolidate the support to biomedical research aimed at facing the most serious illnesses. During this period, the strategy of the "la Caixa" Foundation in biomedical research is to support groundbreaking projects in order to increase the competitiveness of research in Spain and Portugal towards the European and international benchmarks of scientific excellence, enhancing the importance of its scientific and medical impact beyond its borders. The "la Caixa" Foundation promotes projects with both basic research and a clinical and translational perspective. The "la Caixa" Foundation supports the transfer of knowledge and technology to society, endorses the principles of Responsible Research and Innovation, and believes that international collaborations of excellence improve health research. In this regard, the "la Caixa" Foundation launches an open call to select outstanding biomedical research projects that aim to address some of the main health challenges currently faced by our society.

In the HR17 (2018 exercise) for example, 12 million Euros were distributed to 20 projects out of an original pool of 785 applications. 4 projects focus on Cardiovascular disease, 5 on Neuroscience, 4 on Infectious diseases, 4 on Oncology and 3 on other biomedical areas. [10].

UEFISCDI, Romania

Through evaluation of projects for UEFISCDI, Romania, contributing to the 3rd National Plan for Research, Development and Innovation for the period 2015-2020 (PNCDI III), the following intended impacts were achieved:

1. Increase competitiveness of the Romanian economy through innovation;
2. Increase Romanian contribution to the advancement of knowledge;
3. Increase the role of science in the society.

Other funding agencies

Space limits the level of detail that can be given about involvement with other agencies. Contributions include working on the national Open Call for Industry Driven Research organised by the Central Finance and Contracting Agency (CFCA), Latvia and on successive calls organised by NCSTE, Kazakhstan.

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

[7] How to become a H2020 Evaluator, EURAXESS, 2018
[https://cdn5.euraxess.org/sites/default/files/how to become a h2020 evaluator 0.pdf](https://cdn5.euraxess.org/sites/default/files/how_to_become_a_h2020_evaluator_0.pdf)

[8] Jan Franke, Martin Humburg, Manuel Souto-Otero, FP7 ex post and H2020 interim evaluation of Marie Skłodowska-Curie actions (MSCA) Final Report, DIRECTORATE-GENERAL FOR EDUCATION, YOUTH, SPORT AND CULTURE, EUROPEAN COMMISSION, 10.2766/103174, 2017.

[9] Bernd Beckert, Petra Schaper-Rinkel, Ulrich Schmoch, Dana Wasserbacher, Visionary and Collaborative Research in Europe. Pathways to Impact of Use-inspired Basic Research, FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI & AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH, 2018

[10] Call for Applications Health Research Projects Summary of Results, "LA CAIXA" FOUNDATION, 2018 <https://fundacionlacaixa.org/en/results-hr18-call>