Performance-Based Research Fund

Mathematical and Information Sciences and Technology panel-specific guidelines 2012 Quality Evaluation

Introduction

The Performance-Based Research Fund (PBRF) 2012 Panels have developed guidelines to assist staff members with the processes of developing and submitting Evidence Portfolios (EPs). These guidelines provide advice on specific areas that relate to the subject areas of Mathematical and Information Sciences and Technology and do not replace or supersede the requirements for EPs that are set out in the *PBRF Quality Evaluation Guidelines 2012*.

The Mathematical and Information Sciences and Technology panel-specific guidelines must be read in conjunction with the *PBRF Quality Evaluation Guidelines 2012*. In areas where the panel-specific guidelines do not provide additional information, this is because the advice provided in the PBRF Quality Evaluation Guidelines 2012 applies.

The panel will be primarily interested in assessing the quality of the NROs and the staff member's contribution to them, and can also take into account the quality of the outlets through which the research has been published.

Please note that peer review panels assess EPs without reference to Quality Categories gained by staff members from their participation in the 2003 and/or 2006 Quality Evaluations.

Mathematical and Information Sciences and Technology panel-specific guidelines

Description of panel coverage

The Mathematical and Information Sciences and Technology Panel will assess EPs in the subject areas described below. The descriptions should be considered a guide – they are not intended to be exhaustive.

Computer science, information technology, information sciences, information systems

Computer and information sciences include theoretical and practical study of the following: adaptive systems, algorithms, artificial intelligence, bioinformatics tools and techniques, computer architecture, computer graphics, computer information systems, computer vision, database, dependable systems, distributed systems, encryption and security, formal methods, high performance computing, human computer interactions, information retrieval, machine learning, multimedia, networks and communications, operating systems, pattern recognition, programming languages, software engineering, speech and language technology.

Information systems includes the analysis, development, application and use of information and communication technologies (including new electronic media) in human activity systems relating to management, organisational, commercial, government, social, and other areas.

This subject area includes educationally-focused research in computer and information systems.

It involves disciplines concerned with the management of both tacit and recorded knowledge, including librarianship and information science, record and archive studies and information management including: information communities and the use and management of information in all forms and in all contexts, all aspects of archive administration and records management, all aspects of information policy in the information society, systems thinking, systems development, information retrieval (including interfaces and gateways), preservation and conservation of recorded information, legal and ethical issues having to do with information technology and systems, and the information industry (including publishing).

Pure and applied

Pure mathematics includes group theory, number theory, general algebra, algebraic and Lie groups, algebraic geometry, topology, geometric analysis, linear analysis, operator theory and operator algebras, complex analysis, ordinary differential equations and dynamical systems, partial differential equations, probability theory and stochastic analysis, harmonic analysis, mathematical

logic, combinatorics and graph theory.

Applied mathematics includes the development of, the analysis of, and the solution or approximate solution of mathematical models including those arising in physical, geophysical, marine and life and health sciences, engineering and technology; it also includes the development and application of mathematical theories and techniques that further these objectives.

The Mathematical and Information Sciences and Technology panel will also consider operations research and optimisation, including deterministic and stochastic models and solution methods.

This subject area also includes mathematics education.

Statistics

Statistics includes applied statistics, statistical methodology and applications, mathematical statistics, statistical computing and graphics, applied probability and statistics education.

Cross Referrals

It is expected that most cross-referrals to the Mathematical and Information Sciences and Technology Panel will come from the following panels: Social Sciences and Other Cultural/Social Sciences; Physical Sciences; Biological Sciences; Engineering, Technology and Architecture; Humanities and Law; Health; Medicine and Public Health; and Business and Economics. Consultation with the Education Panel and the use of specialist advisors is also probable for EPs that document research centred on education in the mathematical, statistical and information sciences.

The membership of peer review panels is designed to enable panels to assess the quality of research in most areas, including those which have a professional or applied outcome. It is recognised that a small number of staff members will have research outputs that require expert advice from outside the scope of the panel membership and/or that may need to be considered by one of the two Expert Advisory Groups.

Expectations for standard of evidence to be supplied

The Research Output component

Because of the relatively large number of peer-reviewed publications available across the range of disciplines covered by the Mathematical and Information Sciences and Technology Panel, it would normally be expected that research outputs would be quality-assured.

Where software or a case study is a Nominated Research Output (NRO) and is said to be quality-assured, staff members should clearly describe the nature of the quality-assurance process that has taken place – for example, where the research has resulted in a commercial product for a firm, the staff member should

describe the quality-assurance process used by the firm to evaluate the research results, note any formal reporting on the outcome of the process, and include supporting statements by the firm. In other words, all quality-assured software or case studies should be considered to have 'non-standard quality assurance'. The required information should be included in the "Description" field.

Where software or a case study is an NRO and is not quality-assured, the staff member should, at least, provide some evidence of the impact of the software (e.g. size of user community, citations by other research groups, patents or other formal intellectual property underpinning the development) in providing reasons for why the software or case study represents one of the staff member's best research outputs. The required information should be included in the "Description" field.

Observing that the acceptance rates for publication in some mathematics journals can be especially low, staff members completing EPs may wish to indicate in some way the relative ranking a journal may have. Modest acceptance rates are also evident for some computer and information science and information systems conferences. Where appropriate (and where this relates to an NRO, staff members should include information on acceptance rates for publications in the "Description" field. The Mathematical and Information Sciences and Technology panel may decide to validate this information.

The Peer Esteem component

In all areas covered by the Mathematical and Information Sciences and Technology panel, but especially in computer and information science and information systems, membership of conference programme committees and invitations to contribute to conference panels will be recognised as a factor in assessing peer esteem.

The Contribution to the Research Environment Component

In addition to journal pre-publication reviews, contributions to published Mathematical Reviews and Zentralblatt für Mathematik will be considered a valid contribution to the research environment. In the areas of computer and information science and information systems, membership of standards committees will also be considered a legitimate and worthwhile contribution.

Elaboration of the definition of Research

The general Guidelines apply, see Chapter 1 Section D: What Counts as Research?

Types of research output

For most disciplines covered by the panel, a wide range of journals and refereed conference proceedings is available for publishing research outputs. Research

outputs of any type will be considered on their merits, and will be assessed in relation to the quality of the output and/or the perceived quality of the outlet in which the research is published. It is acknowledged that some research outputs (e.g. books, research monographs, dissertations, some software) might be expected to involve considerably greater effort than a journal article to produce.

In the information systems area, research-informed teaching cases studies will be considered as a legitimate research output.

Any textbooks submitted must have a research component.

TEOs should note that all research outputs included in EPs must be consistent with the PBRF Definition of Research, as set out in the *PBRF Quality Evaluation Guidelines 2012* (general Guidelines), and must be accompanied by evidence as to quality.

Additional advice from expert advisory groups

EPs can be referred to an Expert Advisory Group (EAG) by either a TEO or by the Chair of a peer review panel.

Where an EP has been referred to an EAG and has **at least one** NRO that meets the criteria set out by that EAG, additional advice can be sought. A score and opinion on the EP will be provided back to the peer review panel the EP is assigned to.

The criteria that will determine whether or not the Pacific Research and the Professional and Applied Research EAGs will accept EPs for consideration will be published on the TEC website.

Indications of the minimum quantity of research output expected to be produced during the assessment period

The general Guidelines apply, see the topic: Chapter 2 Section C: Guidelines for Completing the Research Output Component and Chapter 3 Section C: Assessing and Scoring the Three Components of an EP.

In relation to new and emerging researchers, see Chapter 2 Section E: Assessing New and Emerging Researchers.

Special circumstances

The general Guidelines apply, see Chapter 2 Section F: Dealing with Special Circumstances.

Definitions of Quality Categories

The general Guidelines apply, see the topic: What do the Quality Categories Mean? in Chapter 3 Section A: Panel Assessment: Introduction, and the final three topics of Chapter 3 Section D: Assessing and Scoring the Three Components of an EP – starting with Scoring an EP: Allocating Points for Research Outputs.

Treatment of non-standard, non-quality-assured and jointly produced research outputs

Non-standard and non-quality-assured research outputs

This is relevant primarily computer and information sciences areas, and potentially, some technical statistical

fields. See the above discussion on software and case studies (which are the two most common areas of practice-based research activity) under "General expectations for standard of evidence to be supplied".

Jointly produced research outputs

The general Guidelines apply, see the topics: Quality-Assured and Non-Quality-Assured Research Outputs and Outputs involving Joint Research in Chapter 2 Section C: Guidelines for Completing the Research Output Component.

Where there are multiple authors, staff members must ensure that their contribution to the research output is clearly defined in the "My Contribution" section.

In cases where co-authors include the same NRO in their EPs, staff members are encouraged to confer about the details of their contributions, to ensure that there is no conflict in the information provided.

Where the list of multiple authors exceeds the 2048 characters allowed in the EP, the authors should be listed up to the extent possible with "plus *N* further authors" included. The academic staff member may also wish to indicate their position in the author list if this falls within the *N* further authors.

Proportions of Nominated Research Outputs (NROs) to be examined[1]

It is intended that the Mathematical and Information Sciences and Technology Panel will examine at least 50% of all NROs in the EPs submitted to it.

Use of specialist advisers

The general Guidelines apply, see the topic: Using a Specialist Adviser in Chapter 3 Section B: Allocating EPs to Panel Members and Obtaining Additional Input.

Specialist advisers will be used to assist in assessing pedagogical research in the subject areas covered by the Mathematical and Information Sciences and Technology Panel.

Elaboration of the descriptor and tie-points for the Research Output component

The RO component descriptor

The Mathematical and Information Sciences and Technology Panel recognises that the standing and impact of the journals covered by the panel can be quite diverse, including some with especially low acceptance rates. The same is true of conference quality, particularly in the computer and information sciences.

Applied statistics has been specifically identified in the tie-point descriptors below. For all other subjects

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[1] "Examined" is defined as either reading an NRO in full, substantially or sufficiently to make an informed assessment, or (for NROs which by their nature cannot be read) an equivalent level of scrutiny.

covered by this panel, the general Guidelines apply (see Chapter 3 Section C: Assessing and Scoring the Three Components in an EP).

Tie-point 6

In applied statistics, staff members will need to establish that they have made a significant original contribution to the research. They might provide evidence that the application area is one of their primary areas of research.

Tie-point 4

In applied statistics, staff members will need to demonstrate that their involvement in the research contributes to more than a routine analysis of the data. They might show that they have made a contribution, for instance, to the design of the study, collecting information, the analysis and report preparation.

Tie-point 2

The general Guidelines apply, see topics: Scoring the RO component and Scoring an EP: Allocating points for research outputs in Chapter 3 Section C: Assessing and Scoring the Three Components of an EP.

Elaboration of the descriptor and tie-points for the Peer Esteem (PE) component

The PE component descriptor

The Mathematical and Information Sciences and Technology Panel recognises that non-academic indicators of peer esteem may arise for some staff members because of the professional nature of applied statistics, computer and informational sciences, and library systems.

Tie-point 6

In computer and information science and information systems, staff members might demonstrate membership of conference programme committees and invitations to contribute to conference panels of international conferences.

Tie-point 4

In computer and information science and information systems, staff members might demonstrate membership of conference programme committees and invitations to contribute to conference panels of regional/national conferences.

Tie-point 2

The general Guidelines apply, see topic: Scoring an EP: Allocating points for peer esteem in Chapter 3 Section C: Assessing and Scoring the Three Components of an EP.

Elaboration of the descriptor and tie-points for the Contribution to the Research Environment (CRE) component

The CRE component descriptor

The Mathematical and Information Sciences and Technology Panel recognises that non-academic indicators of contribution to the research environment may arise for some staff members because of the professional nature of applied statistics, computer and informational sciences, and library systems.

Tie-points

The general Guidelines apply, see topic: Scoring an EP: Allocating points for contribution to the research environment in Chapter 3 Section C: Assessing and Scoring the Three Components of an EP*.*