Impact template (REF3a)

Institution: London Metropolitan University

Unit of assessment: 10 Mathematical Science

a. Context

London Metropolitan University is submitting in Pure Mathematics and in Statistics and OR. We are a small group of pure mathematicians and statisticians. Our future approach to impact is again likely to concentrate on the statistics area, although we will continue to look for opportunities for impact in the mathematics area.

Statistics staff have always paid due attention to real-life problems, often arising from consultancy provided internally or externally. One of our impact statements arose in this way, namely work on fuel poverty carried out in conjunction with a researcher in a substantive area (architecture). The other impact study resulted from the invitation of the WHO for us to join the competition for the preferred methodology for the preparation by the WHO of international growth standards charts. Our presentations and papers on our new methodology no doubt influenced this invitation.

In general our statistical research has been in the area of statistical modelling combined with software implementations. STORM has a long history of software development, from its work on GLIM in the 1980s, leading on to the development of the GAMLSS (Generalised Additive Models for Location, Scale and Shape) packages. Our strategy has been to develop methodology, respected by professional statisticians but also accessible to users through implementation in software. The GAMLSS methodology and software, has been used in different applied scientific fields including: actuarial science, biology, biosciences, energy economic, genomics, finance, fisheries, food consumption, growth curve estimation, marine research, medicine, meteorology, rainfalls, vaccines, risk management etc. Consequently doctors, nurses and sport scientists among others use growth curve charts, created by the GAMLSS methodology and software, worldwide. Distributions, created within the R GAMLSS packages, have been found useful for evaluating risks by banks and insurance companies and more generally we have received many communications from a variety of non–academic users. We do have evidence that the following non-academic organisations have contacted us recently for advice on the GAMLSS software: National Park Service (US), Electro-Thermal Equipment Corporation (US), Sina Corporation (China), The George Institute for Global Health (Australia), Commonwealth Bank (Australia), Prudential plc (UK), IMM institute of Environmental Medicine (Sweden). Also from private discussions we have had with Dr Agus Sudjiano (Director of Analytics and Modeling at Lloyds Banking Group), he confirms that in his previous job in the Bank of America, GAMLSS models were used in the training for risk management and considered to be “state of the art”.

The impact of the work of London Metropolitan University in software implementations of

statistical modelling has allowed users throughout the world to carry out a wide range of analyses in substantive areas. Thus, for example, the GAMLSS website (www.gamlss.org) received over 9000 visits last year, and numerous email enquiries for advice and support, many of which are from non-academic users.

b. Approach to impact

The statistics group has for many years offered an internal and external statistical advisory service. We have always been receptive to providing help and advice and carry out analyses for external users in commerce and the public sector, for example the Royal Free Hospital, Prudential Insurance and Lloyds Bank. Much of our consultancy has followed the University's long standing commitment to social responsibility and social justice, in carrying out research both within the community of scholars and the wider working community.
Our general approach has been to develop software that allows users to do an appropriate statistical analysis of their data. In recent years, we have chosen to develop software in the R framework so that it is available at no cost to users throughout the world. We support this in various ways; by providing a comprehensive website, by offering courses and presentations in the UK and abroad and through email.

The University and Faculty encourage STORM members' collaboration with industry, commerce and other bodies (government or private) likely to have an impact. Members who are involved in those activities are rewarded appropriately with promotions or research relief. The Faculty structure encourages sharing expertise between the research centres of the Faculty and provides resources and help, recognizing that this collaboration is likely to increase the probability of the research having impact.

c. Strategy and plans

We are a small group of pure mathematicians and statisticians. As indicated above, our future approach to impact is more likely to concentrate on the statistics area, although we will continue to provide stimulating pure mathematics sessions for school students and to look for further opportunities for impact in the mathematics area.

In the statistics area, our main approach to impact will be to continue to develop statistical methodology appropriate to the needs of users in substantive areas. We will develop software to enable users within and without academia to utilise the latest developments in statistical modelling. We are currently developing methodology and software for GAMLSS time series and spatial applications, both areas with considerable potential impact. Indeed, we also see potential developments of models which have both a spatial and time series dimension, for use in environment modelling (e.g. global warming) and health analysis, for example the evolution of atmospheric aerosols over time. We will ensure that GAMLSS is even more accessible to non-specialists. We will provide short courses for users outside the academic sector and complete a GAMLSS book oriented to practitioners. In the short term we will provide support to ABM Analytics in their work on oil and gas prediction and develop our work with a major bank's risk management and we will continue our links with a local hospital. In the medium term we will actively expand our well-developed history of consultancy work with academic colleagues from substantive disciplines, both internally and externally, this being the avenue from which

we can produce research with impact.

Members who are involved with promoting activities that can potentially lead to impact, are eligible for reduced teaching time.

d. Relationship to case studies

We have two submitted case studies, one arising from our on-going consultancy services, the other from our dissemination of GAMLSS in R. They both show examples of our commitment to high quality statistical modelling applied to important practical real life issues.

The WHO case study is related to health and human growth development throughout the world. The WHO chose our methodology after an international competition, to produce internationally used children's world standard growth tables. We collaborated with WHO for more than a year to develop the methodology and software to produce these tables, at essentially no cost to WHO. The impact from the creation of those curves will be considerable, since those curves will be used for the next 20-40 years for checking the growth development of children in more than 140 counties who have adopted the WHO standard growth curves.

The fuel poverty case study is research focussed in the community at large. In particular, this work has provided evidence to local authorities, central governments and support groups for the elderly. The social impact of this research is the increased awareness of the relationship between fuel poverty and poor health for the elderly. Again this work was produced at no cost to these users. We disseminated the results by reports, papers, press releases and by presentations to both statistical and substantive conferences and workshops.