Institution: University of the West of England, Bristol

Unit of Assessment: 3 - Allied Health Professions, Dentistry, Nursing and Pharmacy

a. Context

The main non-academic user groups benefiting from the Unit's research are industry and the public sector (particularly NHS professionals and patients). Biomedical diagnostic industries benefit from the development and exploitation of rapid testing devices that diagnose ill health. Healthcare professionals gain through the provision of evidence based guidelines to provide more efficient services. Patients and the public benefit from improved diagnosis by the utilisation of standardised and validated biomarker analysis; and by clinical research that develops and evaluates interventions, new guidelines and policies, leading to improved patient well-being.

Four main types of impact specifically relate to the Unit's research. **1. Economic** impact**,** including evidence of improved cost-effectiveness in diagnostics and healthcare delivery, achieved by *Biomedical Research and Diagnostics* and *Long-term Conditions*; **2. Commercial** impact; including the development and adoption of new products by industry in collaboration with *Biomedical Research and Diagnostics*; **3. Health and welfare** impact**,** including documented changes to guidelines, improved clinical outcomes and enhancement of patient experience, are achieved by Research Group 1: *Biomedical Research and Diagnostics*, Research Group 2: *Appearance and Health*, Research Group 3: *Child Health,* and Research Group 4: *Long-term Conditions*; **4. Public policy and services** impact; including input and influence to policy debate and change, achieved by *Child Health* and *Long-term Conditions.*

b. Approach to impact

i) Mechanisms to support impact

The Unit's approach to impact was supported through drawing on external and internal expertise and guidance from: a) University Research Centre Advisory Board members who are invited experts from industry and healthcare, b) The University recognised Institute of Bio-sensing Technology (IBST) which brings together the academic research community with industry and healthcare stakeholders, described in the environment template (REF5,Section a), c) The TSB's Knowledge Transfer Networks (KTNs), d) the Science Communication Unit (SCU), and e) the University Research Business and Innovation team (RBI). As part of a comprehensive service, the RBI team provides expertise and administrative help for networking and liaison with stakeholders, public engagement events and conferences. They provide advice on translational opportunities, contracting, finance and intellectual property protection. The Unit has developed a network of health service users and carers, who are trained and paid for their input into research. Similarly, clinically based research teams support patient involvement in developing and undertaking research. Success in knowledge exchange activities is formally recognised and rewarded as part of staff annual appraisal and promotion procedures.

ii) Approaches to achieving impact

The Unit developed three approaches to achieve impact, all of which benefited from the support mechanisms described under *i) above*;

1. Supporting collaboration with the pharmaceutical industry: The Unit has capitalised on the UWE IBST European funded Biomedical iNet programme. This has led to **economic**, **commercial** and **health and welfare** impacts, secured through collaborations with the healthcare industries. One specific example of industry collaborations aided by the Biomedical iNet is: **McCalley's** collaborative research work with Agilent Technologies in chromatographic instrument design leading to more efficient separations of molecules of pharmaceutical and biomedical importance. Staff have been encouraged and supported by RBI to engage in prestigious Research Council Co-operative Awards in Science and Engineering (CASE Awards) with industry, on the pathway to achieving **economic** and **health and welfare** impact. Successes include: **McCalley,** Engineering and Physical Science Research Council (EPSRC) CASE award with GlaxoSmithKline on the development of polar compounds by high performance liquid chromatography for the pharmaceutical industry; **Varadi**, Medical Research Council Industrial Collaborative Studentship with AstraZeneca related to the development of an imaging based technique to test efficacy of anti-hyperglycaemic drugs.

2. Supporting collaboration with health services and healthcare professional groups: Through representation on expert panels, a number of staff have achieved **health and welfare** impact, by developing evidence-based clinical and public health guidelines. **Rhodes** co-authored, with members of the *American Society of Clinical Oncology* and *College of American Pathologists*,

evidence-based guidelines for the clinical testing of hormonal receptors in breast cancer. These have changed the way assays are performed and reported in clinical practice. **Alford**, with other members of the British Association for Psychopharmacology international expert panel, has produced evidence-based guidelines for the treatment of sleep disorders. The guidelines were downloaded over 2500 times in the last three years and have changed the practice of physicians treating sleep disorders. Furthermore, he has attended the UK Committee on Toxicity contributing to their statement on caffeine and alcohol co-consumption affecting regulatory bodies both nationally (Food Standard Agency) and internationally. **Albarran** and **Moule's** research on witnessed resuscitation has influenced clinical guidelines of the European Resuscitation Council (2010), impacting on resuscitation practice across Europe. **Mytton's** research is included in National Institute for Health and Clinical Excellence guidelines (2010, 2013) on effective strategies to prevent unintentional injuries in children aged under 15 years.

A further approach to supporting **health and welfare** impact in the development of clinical guidelines was to appoint academics with a clinical role and involvement in patient care. **McCabe's** work at the Royal National Hospital for Rheumatic Diseases, Bath has concentrated on the patient benefits of mirror visual feedback. This is now included in treatment guidelines for patients with Complex Regional Pain Syndrome, adopted nationally (see Goebal et al 2012: UK guidelines for diagnosis, referral and management in primary and secondary care). **Benger's** research within the Emergency Department, University Hospitals Bristol NHS Foundation Trust has led to improved interiors to emergency ambulances. In addition, **Benger's** work supported by an EPSRC and Community Urgent Response Environment Knowledge Transfer Partnership with Great Western Ambulance Service, focussed on the development of portable packs and mobile treatment units to enable effective patient care at the scene and where possible avoid hospital transfer. The collaboration reduced hospital admissions thus achieving a high degree of cost- effectiveness and **economic** impact.

3. Involvement of service users, carers and the public: The Unit has supported **public policy and services, economic** and **health and welfare** impacts. Engagement with the end-users of research has achieved improved clinical outcomes and enhanced patient experience. **Fletcher, Towner, Mytton** and **Deave** work with Parent Advisory Groups and young people in schools and in clinical settings. This has informed the development of research questions and facilitated user input into research projects. The involvement of young people led to the development of an award winning smart-phone application which is used by children with chronic fatigue and by their clinicians.

Staff are involved in public engagement activities. **Killard,** as part of the EU funded project on the development of smart diagnostic devices, developed a short course on sensors and diagnostics for primary and secondary school children. **Conway** secured a Biotechnology and Biosciences Research Council (BBSRC), Public Engagement Award (2009) to deliver workshops to level 7/8 students, teachers and the lay public. **Rhodes** involved the lay public in two CPD registered conferences, Prostate Cancer in the South West (2009) and Current Issues in Breast Cancer (2010). **Condon,** presented findings from research with Gypsies and Travellers to these communities. The events included cookery demonstrations for the community, offering a public health benefit for participants. The Unit has also generated an e-book series on 'Health' to promote its health research to professional and lay audiences; *Improving Health for People with Long-term Conditions* (http://www1.uwe.ac.uk/hls/research/healthandclinicalresearch/newsandevents.aspx)

c. Strategy and plans

At a strategic level, Business, Public and Community Engagement are led by the PVC for Research and Business Engagement with Faculty input at Associate Dean level. The Unit strategy for impact is linked to the University plans and the Faculty Impact Strategy. It builds upon previously successful approaches (as described in section *b*) and has two key themes:

1. ***Mechanism to support the achievement of impact****:* Our Unit strategy draws on the existing expertise available in the University RBI team and the IBST, as well as with the KTNs, all of which facilitate research with external collaborators (see Section b, i). We will invest our Higher Education Innovation Fund 2011-2015 allocation and provide dedicated time for staff to support impact-related activities (see next section). RBI hosts a Knowledge Exchange community of practice in which we are represented (**Dures, Deave**). This academic staff network shares good practice in different types of stakeholder engagement across the University. A Business Development Manager will be appointed to facilitate engagement with business across the Faculty.

In addition, we will appoint Impact Champions with dedicated time who understand the research strengths and opportunities in each Research Centre. They will be supported by an impact group which will provide a formal mechanism to bring together expertise from RBI, IBST and the Centres. The University's RBI team will build upon its existing Client Relationship Management Database to helps academics to identify and share potential collaborators and join relevant networks. We will also develop a toolkit to support the documentation and evidencing of impact, for example through surveys, podcasts, blogs. Staff induction and development will include training in our approach to impact and the development of 'pathways to impact' statements required as part of our project approval process. A web-based system will be developed to capture the 'pathway to impact' statements and impact case study data which will be reviewed annually. The repository of impact case studies will be used to inform the development of curricula for students and professional staff. In addition, we will roll out more widely staff training to support commercialisation, consultancy and public engagement, drawing on the expertise of the SCU and the National Co-ordinating Centre for Public Engagement (funded by the four Higher Education Funding Councils, Research Councils UK and the Wellcome Trust and hosted by UWE and University of Bristol), which initiated a national manifesto for public engagement supported by a number of universities including UWE. Continued close working with both groups will support the development and delivery of a wider range of public engagement activities (such as Science Festivals, Museum Exhibitions, Public Lectures and Debates, Workshops, Social Media (including Blogs, YouTube, Twitter), School events, continuing professional development) with clear evidence of impact. Academics will be supported in bidding for public engagement grants. The best examples of action to achieve impact will be rewarded through an annual prize for impact activity.

2. Plans for supporting and enabling impact: We will continue to invest in existing good practice in supporting collaborations and patient and public involvement in research as detailed in Section *b*, *i*). We will build upon our current involvement in the Bristol Health Partners through provision of protected time and investment in resources. Staff will be supported in the leadership and membership of new collaborative Health Integration Teams, designed to integrate research, innovation and education to transform healthcare delivery and prevent disease in Bristol. The impact of this work will be evaluated through the CLAHRC*west* effectiveness and evaluation stream. We plan to maximise the potential for impact through a continued policy of healthcare-based strategic research appointments, with scope to undertake research with a clearly defined clinical need. We aim to ensure that our research is incorporated into clinical practice guidelines (e.g. NICE) or a Trust Commissioning for Quality and Innovation (CQUIN) target. A programme of workshops, business breakfasts and other events involving academics, research stakeholders, the public and funders, will aim to co-create research programmes with impact. Our involvement in the West of England Academic Health Science Network will accelerate the spread of innovative, evidence-based care to improve healthcare quality. The Unit will invest in the Severnside Alliance for Translational Research (SARTRE) Bio-E initiative, which aims to develop cross-collaborative research projects focussing on technologies for bio-medical applications. The Unit will respond to research calls to bid for funds to support research with the potential for translational impact, such as the MRC Confidence in Concept Scheme. Researchers will engage with industry through the University located Centre for Alternative Testing and *in vitro* Methods (CATIM). This Centre collaborates with Health Protection England, University of Bristol, Clarity Bio-solutions, Humane Society International and North Bristol Trust. It offers industry the opportunity to access cell-based models for a range of applications. Specific workshops (e.g. on 'Basic cell culture', 'Continuous cell cultures in bioreactors' and 'Development of vaccines') will be organised bringing together academics and industry partners. Our impact activities and examples of good practice will be disseminated to staff and external stakeholders using web-based media, continuing professional development and public engagement events. We will organise public debates similar to that UWE hosted recently (BRACE Dementia Public Debate chaired by Jonathan Dimbleby and involving **Conway**). We will deliver an annual public engagement conference that supports the transfer of knowledge between the Unit, healthcare commissioners and providers and industries.

d. Relationship to case studies

The case studies informed and exemplify aspects of the Unit's approach to impact outlined in section b and informed our strategy and plans for future impact outlined in section c.

1. <u>Supporting collaboration with pharmaceutical industries</u>:

Salisbury has developed a bioluminescent bacterial biosensor for monitoring the effectiveness of

cytarabine chemotherapy. With RBI's support in obtaining intellectual property protection, the work has been patented (Application No. PCT/GB2009/001969 Publication Date: 11.02.2010). This test can be used to detect the active form of chemotherapeutic drugs within leukaemia patient cancer cells in less than 8 hours. The IBST and Biomedical iNet assisted in the transfer of the model to industry partners. This diagnostic test system is currently being developed and marketed with Randox Laboratories, funded by an MRC Developmental Pathway Funding Scheme Industrial Collaboration Award (2012). This assay system has led to **economic** and **health and welfare** impacts (*Case study 1).*

The Unit supported the collaboration between **Greenman** and Healthcare International to carry out human clinical trials on oral healthcare products by establishing a malodour laboratory. This led to the commercialisation of oral healthcare products, being marketed, distributed and sold by Boots international (*Case study 2*).

2. Supporting collaboration with health services and healthcare professional groups:

Greenman using our existing mechanism to achieving impact (see section b, i), organised training courses with RBI for academics, clinicians, dental nurses and hygienists to more effectively diagnose and treat causes of breath malodour in their clients. This work has led to **economic** and **health and welfare** impacts (*Case study 2).*

Rumsey's research, developed through healthcare collaborations, identified the need for the inclusion of a Health Psychologist in all UK cleft teams (*Case study 3)*. This **policy and practice** and **health and welfare** impact was a result of **Rumsey's** input to a Cleft Implementation Group established by the Department of Health in 1996. The Unit recognised and adopted this approach to impact, supporting staff contributions to expert panels and groups (see further examples in section *b*. *ii*). The Unit's approach to support **policy and practice** and **health and welfare** and/or **economic** impact was to appoint academics with close clinical links. **Roulstone's** leading–edge research influenced the five recommendations of the Bercow Review of Services for Children and Young People with Speech and Language Communication Needs (2008), which included a National Year of Communication, held in 2011. This research has influenced wider children's speech and language policy. Through her work at the Speech and Language Therapy Research Unit, North Bristol NHS Trust, **Roulstone** has made a significant contribution to the political appreciation of the role language plays in a child's development, underpinning policy initiatives in the field (*Case study 4*). **Walsh** refined and trialled a novel six-week exercise in self-management intervention for people with chronic joint pain from osteoarthritis. Work completed with clinical collaboration resulted in its translation into clinical practice (*Case study 5*). The work of **Roulstone** and **Walsh** has influenced the Unit's approach to impact and thus subsequent key Professorial appointments require and support active clinical involvement (**McCabe** and **Gray)**.

3. Involvement of service users, public, patients and carers

Patient involvement in **Hewlett's** work led to the identification of fatigue as a key issue for rheumatoid arthritis (RA) suffers. This initiated a programme of research that has impacted on **policy and practice** internationally. The impact was achieved through the development of rheumatology treatment guidelines (2006), which recognised that RA fatigue must be addressed in service provision (*Case study 6*). The involvement of parents and children in **Roulstone's** work has led to the development of user involvement guidance published in 2011 (*Case study 4*). The involvement of patients and the public has informed our impact strategy (section *c*, 2.) and underpins a commitment to engage service users and carers in helping to shape research directions and priorities. This approach is incorporated in the strategy to support patient and public involvement in research within BHP and CLAHRC*west*.

Rumsey has run public workshops on cleft lip/palate (*Case study 3*) and used public engagement in developing impact. One example of this is the development of an interactive display based in @Bristol which attracted 22,000 visitors in the first six months of 2013 and raised public awareness of Cleft. This was achieved with the involvement of the SCU, which is part of our mechanism for future impact (see section *c*, *1*).