

<b>Institution: The University of Wolverhampton</b>
<b>Unit of Assessment: 34 Communication, Cultural and Media Studies, Library and Information Management</b>
<p><b>1. Unit context and structure, research and impact strategy</b></p> <p><u>a) How Research is Structured across the Unit</u></p> <p>This submission is from the Statistical Cybermetrics Research Group (SCRG), which formed in 2000. It contains 14 full-time and part-time members of staff and usually 4-8 PhD students. Staff employed by the SCRG are on research-only contracts (6) and non-SCRG staff are on teaching and research contracts in the School of Mathematics and Computing (6), or other schools (2).</p> <p>The SCRG operates within the Research Institute for Information and Language Processing (RIILP) alongside the Research Group in Computational Linguistics (RGCL). Both are well known and highly regarded for their internationally leading research. For context, the SCRG was submitted to the "Library and Information Management" Unit of Assessment in RAE2008, where it ranked joint second. In REF2014, the SCRG obtained an average score of 3.37 out of 4 in the "Communication, Cultural &amp; Media Studies, Library and Information Management", which was joint 5th. Almost all its research was rated "world leading" or "internationally excellent", with the second highest average score for research outputs in this subject area.</p> <p>Within RIILP, RGCL and SCRG collaborate on small projects and PhD student supervision, and share administration. They also share a student management board due to a common interest in social-related quantitative research. RGCL and SCRG host a joint research seminar series of invited speakers and PhD student talks. RGCL is in UoA26.</p> <p>The SCRG is led by Thelwall but has no internal hierarchy. Members independently oversee their own research in addition to teaching (8) or content analysis (4) responsibilities and supervising PhD students. Four content analysts work half on joint content analysis tasks as a team, normally with other researchers in the group, and half on their own independent research. Members are free to choose their own research topics. Distinct research directions that overlap with, but are not core to, the remaining SCRG scientometric (quantitative science studies) research are from Bailey (academic writing), Fairclough (attainment and diversity in Higher Education), Levitt (the underrepresentation of disabled people in academia), Makita (ageing and social media), Stuart (academic image sharing), Thelwall (social science research methods), and Wilson (statistics), with non-overlapping research from Tobin (freshwater ecology).</p> <p><u>b) Research Objectives Past and Future and Performance</u></p> <p><u>REF2014 strategy evaluation</u></p> <p>The core submitted REF2014 strategy for 2014-2020 was:</p> <p>"(a) to seek out new opportunities to research new methods for efficient and effective gathering and analysis of web data for new sources and for new problems;"</p> <p>This was highly successful, as evidenced by over 177 journal articles and three books published 2014-2020, about half using altmetrics or social media data.</p> <p>"(b) to extend our existing methods and software to increase their power and widen their scope for applications;"</p> <p>The success is evidenced by two new software tools: <i>TensiStrength</i> stress detection and <i>PeerJudge</i> academic review assessment. Three existing tools have also received substantial upgrades: <i>Mozdeh</i> social media analysis added language support, statistical data mining and gender detection; <i>Webometric Analyst</i> added approximately fifty new scientometric analysis options, such as Google Books citations; <i>SentiStrength</i> added Japanese and Early Modern English support.</p> <p>"(c) to develop an established base to supply contract-based policy-relevant indicators".</p>

The case studies show that we have maintained commercial indicator work and supplemented it with indicator consultancy and UK Higher Education advice.

#### REF2021 research strategy

The primary REF2021 research strategy was topic-based: to develop a series of research strands that exploit the group's methodological strengths and topic knowledge and address important research questions. This was an intentionally flexible strategy with individual research projects typically taking less than six months (except for PhD students and part-time researchers). The following core research themes were developed as part of this strategy, each supported by multiple papers during REF2021.

- *Statistical models for research assessment*
- *Novel altmetric and other web indicators for research evaluation and consultancy*
- *Traditional and web indicator robustness*
- *Science of science*
- *Open science*
- *Social web image sharing*
- *Disability and equality in academia*
- *Gender in academia*
- *Gender in the social web*
- *Literature consumption*
- *Sentiment analysis variations*

Our primary evaluation method is external review through rigorous high-quality journal peer review. We were highly successful with 177 journal articles (Table 1) passing review: 12.5 per submitted staff or 16 per FTE. The core scientometrics journals were *Journal of Informetrics*, and *Scientometrics*, with *Journal of the Association for Information Science and Technology* being the undisputed core journal for library and information science (e.g., <https://doi.org/10.1086/668574>); *Information Processing & Management*, *Journal of Information Science* and *Journal of Documentation* are also recognised high-quality journals, and *EI Profesional de la Información* and *ASLIB journal of Information Management* have excellent editorial support and a growing reputation. These venues have predominated for our articles (Table 1). In 2020 we switched from *Journal of Informetrics* to *Quantitative Science Studies* (per discipline policy, discussed below), which we believe is already a core disciplinary journal.

Table 1. Journal publications from the group during REF2021.

Journal name	Articles
Journal of Informetrics	31
Journal of the Association for Information Science and Technology	30
Scientometrics	27
EI Profesional de la Información	11
Quantitative Science Studies*	10
ASLIB Journal of Information Management	8
Journal of Information Science	5
Online Information Review	5
Learned Publishing	4
Information Processing & Management	3
Journal of Librarianship & Information Science	3
PLOS ONE	3
Research Evaluation	3
Disability & Society	2
Journal of Data and Information Science	2
Journal of Documentation	2

Journal of Altmetrics*	2
Others**	26

\*New journal not in Scopus or Web of Science (WoS); \*\*All except 8 in Scopus and/or WoS

Beyond REF2021 research strategy

We plan to continue with our successful agenda-setting, agile, flexible topic-based research strategy. This approach plays to our strengths and allows members to apply their skills effectively. Our research thrives without project-based funding because we exploit free web data and our own programming. This gives the freedom to publish early research, opening new topics. We follow four stages for major topics.

1. Initiation / agenda setting: Environment scanning for new research problems/opportunities and publishing initial agenda-setting analyses.
2. Investigation: Developing and evaluating mature methods and findings for the topic.
3. Application: Exploiting the mature methods for problem solving in related areas or practical applications.
4. Maintenance: Updating methods in response to new developments, talking to users about potential novel applications.

We additionally plan to (a) support Levitt's disability research towards impact and (b) exploit our social media analysis strengths to help open ethnicity-related research strands within a new multidisciplinary digital humanities centre.

c) Impact from the research and the link to Impact Case Studies

The SCRG has a multi-pronged strategy to ensure that its research is as impactful as possible (a) within its discipline, (b) within other disciplines, (c) in applied scientometrics (e.g., research evaluations), and (d) outside of an academic research context. The underlying themes are open sharing of papers, software and data to promote availability, training and online help information to promote methods and software re-use, and consultancy to apply knowledge to practical problems outside research contexts. The approach and outcomes are described in detail below.

- *Social media analysis software and methods in the wider social sciences*: The Mozdeh software to gather and analyse social media content from Twitter and YouTube has been promoted to the wider social sciences. It incorporates search and filtering technology as well as word-frequency based statistical association mining methods to support big data pattern detection, including for gender (male, female, nonbinary), sentiment, country, time and topics. Mozdeh existed in a more basic form before 2014. It is freely shared online for other researchers (<http://mozdeh.wlv.ac.uk>) with instructions, examples, a free book (Social web text analytics with Mozdeh), methods-based book chapters and methods-based and applied journal articles. Throughout the current REF period, these methods were disseminated through one-day social media data analysis training workshops at least twice every year (except 2020 due to Covid-19) at the Cathie Marsh Institute for Social Research at The University of Manchester. The social media data analysis course was also delivered in the UK (Northern Ireland and North East Doctoral Training Partnership) and internationally (University of Malaya, St Petersburg School of Social Sciences and Area Studies, Yonsei University in South Korea), and in Wolverhampton courses and during invited lectures to MA students at the Oxford Internet Institute (2014-2018). Online for Covid-19: <http://mozdeh.wlv.ac.uk/SocialMediaDataAnalysisCourse.html>.
- *Alternative indicator software and methods within the discipline and for practitioners*: Free software and training was used to disseminate alternative indicator research within the discipline and to end users of disciplinary research (typically research evaluators working for funders or governments). The software *Webometric Analyst* incorporates all SCRG alternative indicators and most SCRG scientometric methods and is shared free online with examples and instructions (<http://lexiurl.wlv.ac.uk>; active throughout the REF period). It is described in a related book, *Web Indicators for Research Evaluation: A Practical Guide*. *Webometric Analyst* existed in a limited form (focusing on web search engines) before the current REF period. This software allows academic indicator data gathering from Altmetric.com, Mendeley (for readership data) and about 20 other academic-related sources.

It also incorporates statistical analysis and reporting tools, with over 150 menu options and buttons. To disseminate the software and associated impact assessment methods, the SCRG has run a free two-day Alternative Indicators Summer School annually since 2016 to an international audience of PhD students, researchers and research managers (<http://cybermetrics.wlv.ac.uk/SummerSchoolSeptember2020.html>, moving online for Covid-19). This course was also delivered at the University of Malaya in 2019. Thelwall also co-taught a one-day Statistics for Responsible Bibliometrics course with the Lis-Bibliometrics Forum in 2018 and 2019 for UK librarians and research managers. This impact has been on academic research management and external consultancy, forming one impact case study (*Using Indicators*).

- *Research evaluation expertise*: Consultancy and expert advice have been used to disseminate and apply expertise in research evaluation contexts. Consultancy has taken the form of small contracts in conjunction with IDEA Consult (Belgium) on research evaluation and for JISC in the UK and the UN. Expert advice has been given through membership of the HEFCE Independent Review on the Role of Metrics in Research Assessment and Management (2014-16) as one of its two scientometric specialists and co-authorship of its influential report, *The Metric Tide* (2016). This was followed by membership of the UK Forum for Responsible Research Metrics (Universities UK, 2016-) as the main scientometric specialist, as well as numerous subcommittees and short-term indicator specialist roles (e.g., Procurement panel for the REF 2021 citation data; REF metrics user group). Online talks have also been given for the commercial academic database Dimensions.ai, for Altmetric.com, Digital Science and the Researcher app as part of this. This forms one impact case study (*Software and Consultancy*).
- *Sentiment analysis software for computational linguistics, big data analysis and industry*: The sentiment analysis software, SentiStrength, developed in the previous REF period, has continued to be shared free online (<http://sentistrength.wlv.ac.uk>) together with brief instructions. The commercial version was given free to 2259 researchers/students (via email request 2014-2020; its paper has 1750+ Google Scholar citations, evidencing widespread academic uptake). Five sentiment analysis training courses (one to five days) have been given based on SentiStrength in the UK and internationally (Spain x2; Russia; Greece) to disseminate it to computational linguistics, computer science and complexity science academic audiences, in addition to book chapters to encourage its use in an educational context. This supports one impact case study (*Software and Consultancy*).
- *Protected characteristics and other public engagement*: Findings about gender and disability can benefit from wider dissemination. Press coverage has been sought for gender research that would either help to promote a positive message or highlight an area of concern, targeted at the university sector. For example, findings that female-led research had average citation and educational impact that was higher than for male-led research in the UK (and USA), contradicting previous research that found the opposite, was covered by *Nature News* and *Nature Blogs*. An article about disciplinary differences in the extent of gendering research fields in India received online science magazine coverage in India. Press coverage has also been obtained for other studies of wider interest, such as the use of poetic language in article titles (Times Higher Education). This is additional to the impact case studies.

#### Future strategic aims and goals for research and impact

Our post-REF2021 impact strategy will partly continue the REF2021 strategy, using our innovative methods to support the information industry, social media researchers, and research evaluators. Additionally, we aim to impact the lives of disabled academics through Levitt giving talks and shaping policy via relevant committees. He has become expert and can make valuable contributions on this important issue. We also expect to be part of a new collaborative digital humanities research centre dealing with ethnic minority cultural issues, from which we plan to make substantial cultural contributions to society and ethnic minority communities.

#### d) Supporting Interdisciplinary Research



Members attend the joint seminar series with RGCL, exposing them to linguistic issues. SCRG research is highly interdisciplinary (publishing in 18 of the 27 Scopus broad fields) and members at its monthly doctoral forum hear about statistics, scientometrics, disability, gender, and social web analyses.

The interdisciplinary collaboration strategy centres on identifying researchers from other fields that might benefit from collaborations that exploit our methods. The strategy comprises: (a) publicising methods in books, journal articles and software websites (sentistrength.wlv.ac.uk, mozdeh.wlv.ac.uk, lexiurl.wlv.ac.uk, socscibot.wlv.ac.uk), (b) teaching methods and software through training workshops at Wolverhampton and elsewhere (about three per year), (c) responding positively to requests for advice or co-authorship collaboration requests with other disciplines, (d) encouraging group members to pursue and develop their own interests in other fields, and (e) reading into new fields when identified as methods-relevant. As an example of (e), research for the paper, “Anthropomorphizing Atopy: Tweeting about Eczema” harnessed Mozdeh-based methods but necessitated reading into eczema from a nursing perspective.

#### e) Progress towards an Open Research Environment

SCRG has had a policy since 2004 of publishing papers, software and data as openly and as early as practically possible. All SCRG research outputs are published as openly as permitted by publishers, in the University of Wolverhampton’s WIRE repository, and, when earlier open access publishing is permitted by the publisher (Elsevier), in the disciplinary repository arXiv (<https://arxiv.org/search/cs?searchtype=author&query=Thelwall%2C+M>). This is usually within a week of final acceptance or the date first permitted by the publisher. For findability, publications are linked by researchers’ CVs, usually accompanied by a brief explanatory text (e.g., [www.scit.wlv.ac.uk/~cm1993/mycv.html](http://www.scit.wlv.ac.uk/~cm1993/mycv.html)). The SCRG prioritises, and almost always selects, publishers that permit immediate sharing of the author accepted manuscript to avoid publishing delays. Since the SCRG is a publication-intensive research group, it would be too expensive to target Gold Open Access journals, so the group targets Green Open Access, by default, with exceptions in special circumstances (PLOS ONE occasionally for its broader audience).

As introduced above, the SCRG freely shares all its research software through dedicated websites. These include a web crawler (socscibot.wlv.ac.uk, 2004-), social media analytics (mozdeh.wlv.ac.uk, 2006-), Webometric Analyst (lexiurl.wlv.ac.uk, 2006-; 7,554 downloads 2014-2020), sentiment analysis (sentistrength.wlv.ac.uk, 2009-), stress analysis (sentistrength.wlv.ac.uk/TensiStrength.html, 2016-) and academic peer review (sentistrength.wlv.ac.uk/PeerJudge.html, 2019-).

Data and supporting research information is shared freely when permitted by copyright, usually on FigShare. Whilst most raw data used by the group is proprietary (e.g., Scopus data owned by Elsevier; tweets owned by Twitter), aggregate data associated with papers can be usefully shared in many cases (e.g., numbers behind graphs). In addition, group papers often have formal or informal online supplements with additional data or graphs. For example, the group shared 81 datasets on FigShare since September 2013 (62 in 2014-2020), downloaded an incredible 14,512 times ([https://figshare.com/authors/Mike\\_Thelwall/452631](https://figshare.com/authors/Mike_Thelwall/452631)). Examples of general value datasets include: gender orientations of academic fields from three librarians and datasets of peer review texts. This data is FAIR (DOIs, re-use licenced), including some convertible Microsoft document types.

Members have supported disciplinary and trans-disciplinary initiatives for increasing transparency in research. The current key scientometrics issue is that most citation analyses rely on commercial Web of Science or Scopus data, blocking reproducibility. The SCRG has supported efforts to overcome this, such as the initiative for open citations (i4oc.org) drive to put all citation data in the public domain. For this, Thelwall participated in the mass resignation of the Journal of Informetrics Editorial Board and creation of the new open access MIT Press Quantitative Science Studies journal ([www.mitpressjournals.org/loi/qss](http://www.mitpressjournals.org/loi/qss)). Thelwall also participated, as a metrics expert, in a funder-led international and transdisciplinary effort to

create an open toolkit for assessing open science (<https://gatesopenresearch.org/articles/3-1442>). Thelwall was also a member of the Open Access Scholarly Publishers Association, Article Metrics Committee 2014-2016, behind the Event Data initiative for open indicator/event sharing between publishers. Our research and PhD student Khan have also addressed data sharing for other research fields, including biodiversity, genomics and academia in general (FigShare, Scholix).

#### f) Supporting a Culture of Research Integrity

SCRG studies are monitored by the ethics committee within the Faculty of Science and Engineering. Most SCRG research uses public academic data or numerical data, such as citation scores, that does not trigger ethical concerns, with two exceptions. Staff that perform surveys or interviews must pass the Faculty ethics committee procedure to ensure that respondents are fairly treated (e.g., informed consent). Also, researchers using public social web data (e.g., tweets) are not permitted to identify individual users by username or with an exact quote that could be Googled. This step is important to ensure that nobody has attention drawn to them through the research of the group.

For research integrity, PhD students and staff are instructed by University of Wolverhampton research integrity and ethics training, when first appointed. The SCRG abides by University-wide policy and internally monitors its work for research integrity before being submitted for journal refereeing. In addition, in 2020 the Research Institute student management board began to conduct annual audits of research student ethics to report at University level. This will also serve as a useful annual reminder of the importance of research integrity for PhD students.

## **2. People**

### a) Staffing Strategy and Staff Development

The research group follows the University's implementation of the Concordat to Support the Career Development of Researchers by: (a) creating a supportive and inclusive environment to allow members' research to flourish, (b) recruiting based on fit within, and contribution to, the SCRG's research strengths but subsequently supporting members to be in charge of their own research goals, and (c) embedding career development through mentoring, support for training and annual progress reviews.

#### Recruitment strategy

*Innovative supportive pathways for research careers:* We have developed innovative methods to recruit staff into research careers when they have personal circumstances, especially related to gender, caring or disability, that affect their ability to maintain traditional jobs. We created four part-time, remote working jobs in 2015 that were targeted at this group and specifically at people with mobility impairments and part-time carer roles – the latter disproportionately affecting women and blocking career paths for recent female, disabled and carer PhD awardees. These jobs incorporated flexible deadline-free working so that staff could always prioritise other commitments and accept the post in the knowledge that their work would never compromise personal responsibilities and events. We also converted an existing part-time scientometrics research position into a disability in academia position, also with flexible remote working, in response to the changing requirements and interests of the incumbent staff member. Thus, all new posts created during REF2021 incorporated remote working and time flexibility to be suitable for people with carer responsibilities and/or disabilities. Partly due to this, the SCRG's employees and submitted REF staff are now majority female with two disabled researchers.

The SCRG does not control the recruitment of staff on combined academic/teaching contracts but engages with relevant interested staff to help them become research active and pursue their research goals. All staff are on permanent contracts, including the one full-time and five part-time researchers directly employed by the SCRG.

*Early career researcher integration:* All postdoctoral researchers are independent and control their own research directions within very broad remits. New researchers are integrated into the research culture of the SCRG through project-based mentoring and participation in the monthly doctoral forums and/or RIILP seminars. Remote workers never attending the campus are supported to build their own supportive culture through paid team meetings at EU locations of their choice.

*Sabbaticals:* All staff can request sabbatical leave for up to one year and such applications will be judged within RIILP, subject to the quality of the proposal and availability of funds for replacement teachers or content analysts. No applications have been received, we think because all research staff already have time for their own research (50% or 100%) and teaching/research staff enjoy their teaching/research balance.

*Exchanges with business, industry and public bodies.* Our primary means of interaction with non-academic bodies at the personnel level has been through part-time PhD students with non-university jobs (NHS, Digital Science). Physical exchanges for most staff and researchers are difficult due to carer responsibilities.

*Support for impact.* Achieving research impact is a priority for the group and staff are supported with travel costs for visits that may achieve impact and to give talks that may generate impact. For example, Thelwall was funded to visit a Digital Science event in Reading and to attend satellite events related to the *HEFCE Independent Review on the Role of Metrics in Research Assessment and Management* and the *UK Forum for Responsible Research Metrics*, when not funded by HEFCE/Research England. The SCRG has regular meetings with University Impact Officers and its bids are supported by the Project Support Office.

#### Staff development strategy

All junior staff are mentored by a senior researcher. Mentoring takes the form of discussions of research projects and help with research design and paper writing, as well as wider career goals discussions during annual reviews. The SCRG practices open mentoring, with all researchers having free access to all senior staff for advice and guidance, whilst retaining full independence in the choice of research topics and methods. The SCRG encourages postdoctoral researchers to progress their own research so that they are in a better position to move to promoted roles or other posts, if they prefer, than if they supported others' research. The formal aspect of mentoring is an annual progress review, during which staff are asked to make requests for staff development activities, such as training, visits and conferences. There is a one-year probation period for new staff, accompanied by university-level training, and an end-of-year progress validation. In addition to individual mentoring, ongoing staff development is supported by attendance at doctoral forums and research institute talks.

All SCRG members are funded to attend conferences where they have papers accepted. Staff and students are also funded for relevant external training (e.g., statistics, software, research methods). All requests for training or conferences were accepted in the REF2021 period. Makito comments that two courses, "introduced me to practical methodologies that I apply to discourse analysis and semiotic analysis".

Members that are also teaching staff in schools within the University of Wolverhampton have their promotion prospects controlled outside the SCRG but are supported by enabling them to have a good research track record. During the current REF period, Fairclough became Head of Mathematics (Principal Lecturer) with the aid of SCRG-related research evidence. Teaching-focused staff are encouraged to focus on research publishing rather than research service.

A REF2014 personnel goal was to encourage postdoctoral researchers and PhD students to visit other institutions. This has been unsuccessful, with only one PhD student visiting another institution despite repeated offers to cover costs. The reason seems to be that most group

members have family or other ties that restrict their international mobility. A second personnel goal, to help junior researchers become established within the discipline, has been successful in the sense that all (non-retired) researchers have maintained a high-quality publication record.

Evidence of the quality of researchers' development is in the submission doubling from 7 in REF2014, replacing 3: a retirement and researchers that left for industry or moved to Computing. Continued or new excellent publication track records form a second indicator of success.

A new leader for the SCRG is anticipated after the next REF. During the next REF period we plan to adapt the leadership post to be suitable for remote flexible working so that it is accessible for a person with disabilities or substantial carer responsibilities. We also plan to separate the current job from its teaching component so that it can be offered as a part-time professorship role for a suitable candidate, if necessary.

#### b) Research Students

All PhD students during REF2021 have been funded by their employers, REF2014 income, or the University's Research Investment Fund. Funded studentships are advertised and promoted internationally via disciplinary email lists and jobs.ac.uk. The UK produces few graduates with scientometric competence, so advertising encompasses countries with a greater capacity (e.g., Iran, Spain). Funded posts are based around PhD projects designed to address suitable emerging issues appropriate for the PhD duration. Adverts emphasise equality and diversity, and that the SCRG will support remote working for those with disabilities or carer responsibilities that prevent them from travelling. Self-funded PhD proposals are accepted on the basis of capacity to supervise, project match with supervisory expertise, and student capability to undertake a PhD, as evidenced (typically) by a good Master's degree and the ability to formulate a good PhD proposal, aided by supervisors. Out-of-field proposals, including unrelated areas of library science, are rejected.

PhD students attend monthly three-hour doctoral forums (11 months per year throughout REF2021) that are primarily for PhD students but open to all. Attendees talk for 15-30 minutes about their own research and receive questions and comments. These are also social events (free lunch) for informal team building and information sharing. The social aspect is important since most PhD students live away from Wolverhampton. In March 2020 we switched to videoconferencing due to Covid-19, with online chats every Friday to support isolated staff. Members also attend the joint seminar series with the Research Group in Computational Linguistics and PhD annual presentations. SCRG speakers included Nobel Laureate Michael Levitt (Stanford) and Jane Tinkler (LSE/Sterling/Nine Dots Prize).

*Progress and support mechanisms:* PhD students have monthly meetings with their main supervisor (every 2-3 months for part-time students), receive feedback at the monthly doctoral forums and periodically meet other supervisors. Supervisory meetings also serve an informal monitoring purpose. Formal annual progress reviews are held with two independent senior researchers, assessing progress and plans. These include a short formal public presentation.

The SCRG has a vibrant, supportive and highly successful environment for PhD students, supporting the University of Wolverhampton's high PRES rankings. It has a close to 100% success rate since its inception in 2000. Only one student has not completed (within 4 years or 7 for part-time) out of 23 starting a PhD (a first-year health-related withdrawal).

*Skills development and future career preparation:* PhD students attend the University of Wolverhampton's doctoral training courses covering generic research skills (e.g., library use, statistics) and future career planning. PhD students are supported to attend relevant conferences or workshops each year. They can also attend the annual Wolverhampton Alternative Indicators Summer School for networking. They are offered networking visits at other universities by paying for travel and accommodation. When appropriate, they are also invited to



attend project meetings to build their networks and experience. Two PhD students have taken opportunities for paid undergraduate teaching.

### c) Equality and Diversity

*Commitment to equality and diversity in the recruitment and support:* The SCRG is committed to equal opportunities in recruitment and working environment and actively seeks to recruit and support excellent researchers, regardless of age, disability, ethnicity, gender, gender reassignment, marital/civil partnership status, sexuality, religion and pregnancy/maternity needs. As discussed above, support for researchers with carer commitments and disabilities (2 out of 14 have a declared disability) is at the heart of our recruitment strategy, including supporting female researchers (8 out of 14 submitted are women). The fully flexible part-time working approach described above has meant that all five people newly recruited during REF2021 were on part-time, permanent, fully flexible contracts, and all were female, with a disability and/or with a substantial carer role.

We have successfully maintained an ethnically diverse set of staff (6 out of 14 are BAME) and PhD students (8 out of 14 completed and ongoing are female, 8 out of 14 are BAME), by creating a friendly and accommodating environment. For example, because of Muslim members, we stopped having lunchtime meetings in places serving alcohol and because of disability issues we now meet at places that can be reached from the campus without crossing a road. On a day-to-day level we celebrate cultural differences to foster an atmosphere of mutual respect, for example with previous doctoral forum lunches chatting about Persian Nowruz traditions and Nigerian Christian Christmas customs.

In terms of other protected characteristics, the SCRG has recruited staff from a wide range of ages from 30s to 50s, multiple religions (and none) and marital statuses. We are not aware of LGBTQ+ staff applying for posts but have co-authored with LGBTQ+ staff and Makito has helped organise public outreach activities for older LGBT adults and worked with LGBT organisations.

The SCRG has engaged extensively with *Access To Work* to ensure that its disabled staff receive appropriate specialist equipment for their role. This has included special laptops, speech synthesis software and other devices. The SCRG has also worked with *Access To Work* to fully fund an assistant for 10 hours per week for one of its disabled researchers.

*Career pathways for part-time and fixed-term staff:* We support part-time staff with guaranteed time for personal research and support for funding applications, enabling them to build strong research careers to move into full-time or promoted academic posts in the SCRG, a relevant school at Wolverhampton or elsewhere if/when ready. The SCRG has no fixed-term staff.

*Conference attendance and travel to support research for staff requiring aid:* The SCRG engages with *Access To Work* to provide a full-time note-taking assistant and support person at all conferences attended by a staff member with a disability.

*Support for staff returning from leave, with long-term illness or caring responsibilities:* Many staff and PhD students have carer responsibilities, either as the primary carer of children or of vulnerable adults. Our policy of a combination of home-based working (if desired) and complete time and day flexibility is designed so that staff and PhD students can always prioritise carer commitments or illness management. This includes the right to schedule work throughout the year to fit in with other commitments. The SCRG has had no staff returning from a period of leave, but our policy allows staff to choose to take a period of formal leave or to subsume the period within the normal flexible working arrangements. All staff so far have taken the flexible option. PhD students are given the same options when they have gaps due to maternity or other personal issues, and two have taken formal leave of absences. Those returning after an extended period of leave are supported as necessary to re-engage with appropriate research projects. Because of our flexible working arrangements this primarily entails a meeting with the

group leader to plan re-engagement and support to manage their personal expectations for progress in the initial stages.

*Supporting staff and research student wellbeing:* The SCRG supports staff wellbeing by respecting work-life boundaries and never requiring work outside of normal office hours or during holidays. Mental health is an important issue for researchers, especially those working remotely or from home. The monthly face-to-face doctoral forums helps to fight isolation and the part-time distant workers are funded to meet twice per year to build social contact for their wellbeing. A postgraduate research tutor within RILP supports the general welfare of students and postgraduate reps at the RILP student management board can bring forward any issues of concern. PhD students are supported for distance working to allow them to live with partners or family groups. For example, one fully funded PhD student was able to move abroad with her husband's job change and half of the PhD students live far from Wolverhampton for family reasons.

Starting with the first week of the Covid-19 lockdown, the group held a videoconferencing social call every Friday 3-4pm to support staff wellbeing with protection against feelings of isolation. All staff were emailed weekly with University-level Covid-19 advice and support and SCRG-wide emails were sent at the start to assure staff that their personal safety should always come first, including the personal safety of those that they have carer-responsibilities for.

*Equality and diversity in the REF submission:* Submitted SCRG staff included 8 women out of 14 (57%), despite the historical male domination of maths-intensive subjects and our previous REF/RAE submissions. Two researchers with declared disabilities were submitted (14%), exceeding the sector for academic staff with disabilities (4%). Six submitted BAME researchers (43%) exceeds the national percentage (15%). This evidences a successfully diverse submission. Most or all submitted researchers are publicly educated; some are first generation university-educated. The submitted outputs were selected following university strategy, which is designed to safeguard equality and diversity considerations. This involved an independent review by multiple researchers, which staff found to be inclusive. University-level statistical analysis revealed no equality and diversity concerns with this approach.

### 3. Income, infrastructure and facilities

#### a) Research Funding and Strategies for Generating Research Income

The funding strategy has been primarily impact-driven rather than resource-driven. In terms of resources, the group does not require expensive equipment and therefore only needs funding for personnel expansion. The primary impact-driven funding strategy is to apply for relevant consultancy, in the form of projects that generate impact by applying our knowledge and methods to others' problems to generate useful solutions. This has led to numerous small projects (see below) generating specific applied knowledge, often without an associated academic publication.

The secondary strategy has been to generate income for research projects (personnel expansion or collaboration) by (a) supporting interdisciplinary funding bids led by others to promote interdisciplinarity and the uptake of its skills and methods in other fields, and (b) to apply for relevant funding calls. This strategy has not been successful after 2014, with all bids rejected. A contributory factor is that our primary research does not fall comfortably within the remit of any funding council and we have not found a suitable niche.

#### Research projects

2011-2014 EU FP7: Academic Careers Understood through Measurement and Norms (ACUMEN, 266632): GBP150,000.

2014-2016 ESRC: Picturing the social: transforming our understanding of images in social media and Big Data research (ES/M000648/1): GBP10,000.

2015-2018 H2020 Optimum. Generating next generation transportation solutions. (636160-2, unfunded partner, two publications: <https://doi.org/10.1016/j.ipm.2016.06.009>, <https://doi.org/10.1145/3184558.3191627>).

#### Belgian government evaluations

2014 Antwerp Management School: GBP1,500.  
 2014 VLIZ: GBP1,500.  
 2016 Management Research Centre: GBP1,500.  
 2019 Belgian Space Agency: GBP3,000.

#### UN evaluations

2015 UNDP gender empowerment: GBP1,000.  
 2014 UNU-CRIS: GBP1,850.  
 2014 UNFAO: GBP1,500.

#### EU commissions

2015 G7 and EU energy strategy evaluations: GBP8,000.  
 2016 MORE3: Survey sampling and network creation online: GBP10,000.  
 2019-20 MORE4: Survey sampling online: GBP6,000.

#### Others

2014 Metrics literature review for HEFCE: GBP20,000.  
 2019 Open data project for JISC: GBP19,811.  
 2019 Open peer review project for JISC: GBP22,040.

#### b) Organisational Infrastructure Supporting Research and Impact

*Operational and scholarly infrastructure:* The SCRG needs little research infrastructure other than standard office PCs and laptops with internet connections. Its only specialist equipment is a set of three server computers located in a server room in the University of Wolverhampton that are used for long term data collection. The software used is all free and the citation data is either free (Dimensions.ai) or licenced by Jisc (Scopus and Web of Science). IT support is provided by university-wide services, which is sufficient for our modest needs. The server lab is supported by a specialist technician shared with the School of Mathematics and Computing. The advanced infrastructure component of our work is our in-house software (*SentiStrength*, *Webometric Analyst*, *Mozdeh*, *PeerJudge*, *TensiStrength*, *SocSciBot*), which we upgrade ourselves as necessary for new research and consultancy projects. *Webometric Analyst* is added to most weeks and *Mozdeh* is upgraded multiple times each year, sometimes substantially.

#### c) Equality and Diversity

*Equality and diversity issues and support for acquiring research funding infrastructure:* All except two staff members of the SCRG and almost all PhD students have protected characteristics (female, disabled, BAME). In the current REF period, the SCRG has had adequate funding to accede to all researchers' requests and so there has been no occasion on which any kind of prioritisation has been necessary.

All researchers are supported to apply for research funding with time, senior staff support, and University-level support. Nevertheless, since all researchers in the REF2021 period are independent and able to conduct unfunded research, no researcher's ability to conduct research is predicated on funding and we have not prioritised funding. Researchers are supported to apply for funding to aid their careers, but are allowed to prioritise managing their own research projects instead. Given the high current competition for research funding, junior researchers

have been encouraged to prioritise their own research as their primary goal. We view bidding for funding as particularly onerous for part-time staff due to typical high failure rates and the loss of research time associated with constructing a bid.

#### d) Research Infrastructure

The group's main research infrastructure is a set of three servers for ongoing data collection. These support both research and consultancy by allowing extended downloading or web crawling to generate web datasets. This equipment is essential to ensure that data collection for consultancy is fast and does not slow the other work of the researchers involved. For example, the MORE3 and MORE4 projects involved web crawling for the universities of 16 countries to identify a sample for the project to survey. With the three servers working 24/7, this was completed within a month in parallel with ongoing research data collection.

#### e) Benefits in Kind

We have accessed the Dimensions.ai scholarly database and Altmetric.com's academic data sharing programme, which Digital Science grants to qualifying researchers.

### **4. Collaboration and contribution to the research base, economy and society**

#### a) Arrangements and Support for, and Effectiveness of, Research Collaborations, Networks and Partnerships

Members of the SCRG are supported (travel, accommodation) for networking activities to meet researchers in other institutions and for conferences, workshops and training. No requests for this support have been rejected in the current REF period and about 20 were accepted. For example, a PhD student was funded to go on a visiting tour of European universities in the final year of her PhD to make contacts for future job applications and collaborations and she gained employment alongside a researcher that she met on one of these trips.

The SCRG is embedded in an international network of current and former collaborators and former PhD students. SCRG researchers are encouraged to collaborate on research projects with others outside Wolverhampton, including internationally. It participated in the ESRC-funded collaborative project "Picturing the Social". Thelwall is a Visiting Professor at the University of Malaya, was a Research Associate at Oxford University, and was a member of the Ethical panel for the EU project RENOIR.

Collaboration with other countries is encouraged. PhD students from other universities have visited for 3-month periods (Spain [2], Mexico) and Thelwall has co-supervised PhD students from other universities (Nanyang Technological University, Singapore, University of Murcia, Spain).

All researchers have time for their own self-directed research and are free to collaborate with whoever they prefer. Junior researchers are also sometimes encouraged to participate in collaborative research led by senior researchers, but this is optional. Except for funded projects, collaborations are typically article-based but sometimes long term. Although loose, these arrangements are supported financially, when necessary, and are highly successful at generating collaborative outputs. In the current REF period, all 14 submitted researchers produced at least one collaborative journal article or book (excluding the mega-collaborative Gates Open article) with another Wolverhampton researcher, 10 with non-Wolverhampton researchers (e.g., Universities of Bath, Bristol, Lancaster, Manchester (both), Oxford, Sheffield, Warwick, York; Wellcome Trust Sanger Institute), 8 with international collaborators (USA [Stanford and 3 other universities], Spain [CSIC and 3 universities], Canada [2 universities], Finland [2 universities], Belgium [2 universities], Australia, Germany, India, Iran, Israel, Libya, Malaysia, Mauritius, Poland, Russia, Switzerland, The Netherlands) and 5 with non-academic collaborators (AlterSpark [Canada], F1000Research, Jisc, Pulsar Platform, Wellcome).



b) Relationships with Key Research Users, Beneficiaries or Audiences

HEFCE and now Research England (through the REF) and research funders are key potential end users of the SCRG's research. Relationships have been built with these through joint memberships of national committees (e.g., Forum for Responsible Research Metrics) and subgroups. Relationships have also been formed through responses for help with specific issues. For example, a request by Wellcome for a method to detect the early impact of research from one of their new funding streams led to a joint (unfunded) project with Wellcome that produced a journal article co-authored with Wellcome as an output. A direct relationship has also been built with Digital Science through their Head of Metrics Development taking a part-time PhD with the SCRG. We also have long term collaborations with Idea Consult (Belgium) on a series of research evaluation contracts for the EU and Belgian government and with AlterSpark (Canada) for UN projects.

Another example of interaction with end users was participation in an international Open Science initiative in collaboration with many funders, publishing a joint policy document on toolkits for Open Science (<https://gatesopenresearch.org/documents/2-54>).

c) Wider Contributions to Economy and Society

The gender in academia strand of research has received press coverage that has given a positive message about the role of females in academia (e.g., their research has higher average scholarly impact) and identified problems (gender inequalities in some disciplines, in some countries). We hope that the former has helped to contribute to a positive attitude to females in academia and encouragement of girls to consider an academic career, and that the latter has had an influence on policy.

d) Engaging with Diverse Communities and Publics

As mentioned above, the SCRG engages with the wider social sciences through free software and numerous training events for its social media analysis software and methods. The SCRG's extensive research on gender has engaged with the debate about the causes of female underrepresentation in most STEM subjects in academia (11 journal articles published since 2018). The findings have reached a wider and sometimes younger audience of (hopefully) future and training female scientists through press coverage of this research, such as in The Wire, two Nature news articles and a Times Higher Education article. Levitt has investigated disadvantages facing academics and others with disabilities, engaging directly with researchers with disabilities at conferences (2 journal articles, 3 conference papers). Levitt has also engaged as a Member and Befriender of the Macular Society and Member of Committee of a Macular Society group, and as Engagements Lead Member of the Steering Committee of the National Association of Disabled Staff Networks. Fairclough is also a high profile scientist with a disability, promoting inclusivity in higher education (<https://royalsociety.org/topics-policy/diversity-in-science/scientists-with-disabilities/ruth-fairclough/>). In 2020 the group also submitted an article on racism during COVID-19. Mas-Bleda has been funded to present at UK-based Spanish researchers conferences.

e) Contribution to the Sustainability of the Discipline, Interdisciplinarity, Responsiveness

*Discipline sustainability:* The group has helped to support the Scientometrics discipline through attendance at the main conference series (ISSI), editorial board membership of the major journals (Scientometrics, Journal of Informetrics, Quantitative Science Studies, Journal of Altmetrics), through its free Alternative Indicators Summer School annual training, and refereeing (over 750 journal articles or equivalent during REF2021). In other areas, Makita gave talks at four international health/sociology-related conferences. Levitt initiated and chaired a seminar at the Lancaster Disability Studies conference and was a disability advisor to The Inclusion Group for Equity in Research in STEMM. Fairclough co-organised HODOMS

conferences, gave 7 papers at conferences, was a HODOMS member and SIGMA steering group member. Tobin participated in a water-related ERASMUS+ project.

*Interdisciplinarity:* As a partly methods-based group, the SCRG's main opportunity for interdisciplinary research has been through providing methods to address problems relevant to other research fields. Requests for interdisciplinary collaboration have led to an ESRC funded project focused on image sharing in the social web, a project with Lancaster University analysing sentiment in Shakespeare's plays, investigations of modern reactions to Victorian English literature led by a Victorian scholar at the University of Calgary, and international comparisons of value concepts led by a communication Scholar at the Hebrew University of Jerusalem. For example, the Shakespeare project involved developing a sentiment analysis algorithm for Early Modern English and applying it to Shakespeare's plays to help analyse the role of emotion in them. In contrast, the Victorian project involved analysing the book choices of Victorian literature group members on Goodreads. Both projects led to multiple journal articles.

As evidence of wide interdisciplinarity, during REF2021 the group published journal articles or books in as many main areas as it has submitted staff: Library and Information Science (both Information Science and Scientometrics), Disability Studies, Ecology, Economics, English Language, English Literature, Geography, Microbiology, Nursing, Physics, Public Health (Ageing), Psychology, Religion, Social Science (general), and Tourism.

*Responsiveness to national and international priorities:* The primary international priority addressed by the group has been the emergence of altmetrics as a potential source of wider or early impact evidence for academic research. About half of the group's published research has addressed this and on the strength of this research, Thelwall has provided expert contributions to two UK committees and various working groups. The group has responded quickly to relevant social issues through its unique social media analysis contributions. During March-June 2020 for Covid-19 it submitted three related studies to journals (e.g., "Retweeting COVID-19 disability issues: Risks, support and outrage"), two related scientometric studies (e.g., "Coronavirus research before 2020 is more relevant than ever, especially when interpreted for COVID-19"), and an analysis of social media responses to racism after the killing of George Floyd.

#### f) Indicators of Wider Influence and Senior Service Work

The group has received wide international recognition, extensively accepting invitations to contribute to the discipline in expert roles.

*Journal editorships:* The group is represented on the editorial boards of many disciplinary journals, primarily for Scientometrics. Thelwall is the editor of *Journal of Altmetrics*, an associate editor of the historically top library and information science publication, *Journal of the Association for Information Science and Technology* and sits on 5 other editorial boards. Kousha is on the editorial board of *Scientometrics* and Levitt is on the board of *Disability & Society*.

*Conference committee memberships:* The group has participated in the programme committees of multiple conferences from scientometrics, natural language processing and information science. Thelwall was on 15 conference committees (usually multiple years). Kousha and Levitt have participated in programme committees of the main scientometric conference, ISSI (International Society for Scientometrics and Informetrics).

*Prizes:* Thelwall was awarded the Derek de Solla Price Award for "outstanding contributions to the fields of quantitative studies of science" in 2015: the major lifetime achievement award in his research area, and was a Web of Science Highly Cited Researcher in 2017, 2018, 2019, 2020. Mas-Bleda won a *Journal of Documentation* 2015 Highly Commended Paper Award. Kousha and Thelwall won the 3rd SCImago-EPI award for the best paper in *El Profesional de la Información* during 2013-2017 (3000 Euro, paper from 2015).

*Research councils:* Levitt was a member of the ESRC Peer Review College in 2014.

*Invited talks:* Thelwall gave ten international keynote speeches and invited talks, including a keynote at the main scientometrics conference, ISSI, and Levitt gave an invited talk in the USA.

*Academic refereeing:* During REF2021, Thelwall reviewed 690 journal articles, conference papers, grant proposals and tenure/promotion applications, plus 17 PhDs. Kousha evaluated a PhD and reviewed 34 papers for seven journals and two conferences. Levitt assessed a PhD and reviewed for 12 journals. Makita and Stuart both reviewed for four journals, Stuart also reviewing 32 conference papers. Mas-Bleda reviewed least four articles. Maflahi reviewed for two journals and evaluated a PhD. Fairclough refereed 6 papers.