Research Information Management in the UK: Current Initiatives using CERIF

A supporting document for the JISC RIM3 Call, July 2011

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Current Research Information Management initiatives in the UK using CERIF

1 Introduction

1.1 Scope

The current document is intended as supporting material for the JISC Research Information Management (RIM) Call for proposals in August 2011. As such it aims to provide an up to date picture of RIM initiatives and activities in the UK using the CERIF standard. It updates the document produced by UKOLN to support the RIM2 Call in October 2010[1]. Other existing RIM documents[2] provide a background to the UK research domain, the issues surrounding research information exchange and the cost benefits of standardisation. This text consequently focuses on current relevant projects and initiatives based around CERIF, together with the key organisations involved - including research funders and supporting agencies.

1.2 Background: EXRI-UK

The JISC RIM programme grew out of work commissioned in 2009. The EXRI-UK (Exchanging Research Information in the UK)[3] report recommended that CERIF should be the basis for the exchange of research information in the UK. The RIM Group of experts and stakeholders from universities, funders and representative organisations was also convened by JISC initially in order to consider EXRI results and subsequently take forward the RIM programme.

EXRI also recommended that work should be undertaken to align and map metadata semantics across the research domain. As a result several workshops and meetings were organised by UKOLN in 2010 which examined the use of CERIF to map research information between institutions, HESA (Higher Education Statistics Agency) and the RAE2008 submission framework; the Research Council's Research Outcomes Project (ROP) draft specification was also included, although RCUK plans have changed significantly since then (see below).

2 Current and recent projects and initiatives in the UK

2.1 JISC RIM1 projects

The first phase of the RIM programme funded five projects which ran from March until August 2010. The projects were diverse, with two having a business/management approach. CERIF was not a required component, and only the CRISPool and BRIM projects specifically used CERIF. The Enquire project 'looked at' the standard, partly as a result of institutional involvement in CRISPool, but it was not part of the project plan – see below.

2.1.1 CRISPool: Using CERIF-XML to integrate heterogeneous research information from several institutions into a single portal

CRISPool[4] was led by the University of St Andrews. It built a portal exposing data (from heterogeneous, cross-institutional sources) on the web, with basic search and retrieve functionality. CERIF-XML was used successfully to bring together data on people, organisations and publications from three universities for the SUPA (Scottish Universities Physics Alliance) research pool. The CRISPool aggregation system was developed by Atira based on their PURE software platform.

The project demonstrated that a dynamic searchable portal is much better than a fixed PDF publications list for SUPA reporting purposes. It is significant that other research pools have expressed interest in developing a similar portal.

In order to develop the aggregator, each participating university first had to undertake a conceptual mapping from its institutional repository/database schemas to the CERIF data model. Some CERIF 2008 classifications extensions and workarounds were necessarily devised as a result of this process. Next, CERIF-XML export files had to be created from each existing institutional database. This was quick and efficient for St Andrews which already had a fully deployed PURE system, but was time-consuming for the other institutions. CERIF worked well for mapping from the internal databases/schemas, because of the flexibility provided by the fragmentation of the model; however this very fragmentation caused scalability issues when aggregating data with many related entities e.g. publications with many authors.

Overall the CRISPool findings support the EXRI conclusion that CERIF should be used as the exchange format within the UK research information sector. The implementation of PURE demonstrated the suitability of CERIF for capturing research information internally – CERIF was already in use at St Andrews and Aberdeen which had existing PURE installations (partially deployed at Aberdeen at that time).

As indicated, CRISPool did however find some problems with using CERIF. The main technical issue was the fragmentation of CERIF-XML into many individual XML files; this means that processing is very resource intensive, since each item (whether person, organisation or publication) is defined by data in up to 10 related XML files. CERIF developers face a dilemma here, since the CERIF model needs to represent the real world of interrelated research information, but XML has a linear tree structure which cannot natively represent the complexity required. However, XML is also the vehicle of choice for data exchange in web services.

CRISPool was able to map most of the required data elements to the CERIF data model easily, with two exceptions:

- Contact details – CERIF considers a person's contact details to be an attribute of the person, whereas in the CRISPool model they are an attribute of the relationship between the person and organisation (since contact details change as a person moves jobs); this was worked around using classification

- URIs – CERIF supports a one-to-one relationship between publication entity and URI; CRISPool wished to record a DOI plus a URI for the full text version, but had to choose one only (DOI); this could also have been addressed using classification

CRISPool also worked closely with euroCRIS, and effected changes to CERIF 2008 based on UK requirements.

2.1.2 Using Business Process Management Tools and Methods for Building Research Information Management (BRIM)

BRIM[5] was led by the University of Huddersfield, investigating the feasibility of implementing RIM tools to satisfy the management needs of a university which is growing its research activity significantly. RIM requirements were captured and a pilot system developed to demonstrate a research information layer which integrated with and harvested data from existing institutional systems in a standard, component-based way, and stored it in a model based on CERIF. Initial findings had indicated that it would be difficult to integrate and use data in a fully standardised, service oriented approach, so a slightly modified approach was adopted.

CERIF was therefore used as a starting point in creating the 'RIMS' layer. Given the size of the standard, it was decided that the pilot implementation should focus on a portion of the CERIF model: information on staff research publications – using the EPrints repository. Fields were added to the CERIF model in order to accommodate local data. It was decided not to populate all fields, because some data was superfluous to local needs.

Like CRISPool, BRIM was also positive about the benefits of using CERIF, finding the overall structure of CERIF adequate for the functions of the layer that was prototyped. Huddersfield is also a pilot institution in the JISC CERIFy project, so is still taking forward CERIF implementation.

It is significant that learning about CERIF at Huddersfield carried an additional benefit, in allowing better understanding of local data structures:

> *The primary benefit we were reaping was that by adopting much of the structure of CERIF we were being guided in understanding and capturing the implicit structure of the data we are required to manipulate.*

2.2 R4R: Readiness for REF

The RIM1 projects ran in parallel to the Readiness for REF (R4R)[6] project which started in November 2009, run jointly by King's College London and the University of Southampton. While being based around CERIF, it was funded as part of the JISC Repository Start Up and Enhancement strand.

R4R has developed a CERIF4REF schema based largely on the RAE 2008 format. It has aimed to encompass the types of data that are likely to be needed for REF submissions, (Also available is an XSLT stylesheet to convert CERIF4REF to native CERIF.) As a central part of the project, plugins have been developed to enable repository software to generate CERIF4REF. EPrints, Fedora and DSpace plugins are now available. These will enable repository managers to import data from different systems in a common XML format, and also allow them to generate CERIF data in a form suitable for submission to REF.

Case studies were carried out by seven other institutions, examining the feasibility of mapping local data and practices to the CERIF4REF schema. The results of the study were positive, with all finding the CERIF4REF schema a substantial fit with many of their current requirements.

One of the original project aims was to demonstrate interoperability by automatically exchanging full CERIF4REF-based research data between institutions. However due to data confidentiality problems it was not possible to do this within the project timescale. KCL has however successfully managed exports to CERIF4REF using mappings devised earlier in the project.

2.3 JISC RIM2 projects

JISC funded four projects in the second phase of the RIM Programme, running February to July 2011. In this phase the aim was specifically to increase the uptake of CERIF in UK higher education institutions and research organisations, and to support an emerging community of practice. Some of the projects have involved a large number of partners, including commercial companies developing CRIS software.

2.3.1 BRUCE: Brunel Research Under a CERIF Environment

The BRUCE[7] project is led by Brunel University in collaboration with St George's, University of London, Cottage Labs and Symplectic Ltd. The project is developing a prototype open source tool based on CERIF that will facilitate the analysis and reporting on research information from different HEI departments. In practice this means pulling heterogeneous research data from various sources (e.g. HR, student records, institutional repository), indexing it using CERIF and then creating a new tool that can analyse and report on that data. Apache Solr and Project Blacklight are being used to develop the tool. Given the time constraints a limited set of 'vertical' data is being mapped to CERIF, including HESA data, student records, publications. Challenges have included turning the complex relational CERIF schema into a flat, indexable, set of key/value pairs which can be used by Solr.

Only a small part of the total CERIF model has been used: two Base Entities (cfPers and cfOrgUnit), one Result Entity (cfResPubl) and one Second Level Entity (cfFund). These cover all of the features required to store the data for the example reports.

The BRUCE blog notes a sentiment shared by a number of other initiatives:

> *The team has spent a long time just understanding the schema and working with the data to get it into a format where it can be put into a CERIF database, and it is felt that this ought to be easier.*

2.3.2 CERIFy

CERIFy[8] is a collaboration between UKOLN, University of Bath and Trinity College Dublin. It has been working with four pilot UK HE institutions (University of Bath, Queens University Belfast, University of Huddersfield and Aberystwyth University), as well as a commercial partner (Thomson Reuters).

The project conducted a series of site visits to partner institutions in order to gather user requirements and key strategic objectives, based on stakeholder interviews. As a result four priority areas for research information management and exchange were identified: pre-award management, benchmarking, measures of esteem, and InCites exchange. Business process models were developed for each priority area, based on current practice ('as is') and how institutions would like to manage research information in future within an integrated environment based on CERIF ('to be'). Following a data surgery to identify the data required to support these processes (and given the time constraints), it was decided to focus on measures of esteem, and InCites data exchange. The project has subsequently been working with euroCRIS to map the required data elements to the CERIF model. The resulting mapping will be used within the CERIF CRIS developed at Trinity College Dublin to test and demonstrate interoperability. Institutions will have access to the CRIS in order to help evaluate the usefulness of mapping their data to CERIF.

2.3.3 MICE: Measuring Impact under CERIF

MICE[9] is led by the Centre for e-Research, King's College London. After surveying existing work on encoding structured information on research impact indicators and measures, the project then mapped these to CERIF. The core output is a data model for impact under CERIF: 'a proposed implementation of CERIF for encoding impact indicators and measures'. A feasibility study on integrating the proposed CERIF impact model in PURE has also been carried out by St Andrews and Atira.

Most recently the project has revised the CERIF4REF schema created by the Readiness for REF project in order to incorporate impact statements.

Goldsmiths College reviewed the schema and analysed the proposed MICE methodology in the context of live information environments. Their survey presented the proposed impact measures and tried to determine institutions' current information provisions in relation to these measures. The findings reveal the lack of consistency in recording impact (common across RIM data), as well as the ambiguity surrounding impact:

> *Although more than a third of respondent institutions actually store the data units identified in the survey, very few do so in a consistent and reliable manner [due] to the lack of a central data system and clear data collection guidelines… Given the ongoing, and perhaps intrinsic, ambiguity around the notion of impact, it is very difficult for institutions to determine what data to collect.*[10]

The MICE impact model was submitted to euroCRIS for discussion and has received very positive comments. Discussion about incorporation of this work into CERIF is ongoing within the CERIF Task Group eg Research Output Types may need further consideration.

2.3.4 IRIOS: Integrated Research Input and Output System

The IRIOS project[11] has developed a CERIF-based demonstrator interrogation tool for Research Council (RC) funded projects and their outputs. It demonstrates how institutions could access integrated and standardised information on grants, with the initial participation of two RCs, EPSRC (Engineering and Physical Sciences Research Council) and NERC (Natural Environment Research

Council). As project partners, EPSRC and NERC have provided sample data. The CERIF compliant tool is based on the Universities for the North East Information System (UNIS) platform. Project documentation details how NERC and EPSRC core grant data is mapped from the IRIOS demonstrator to CERIF. Only a small subset of fields was required to be mapped. euroCRIS is also a project partner, providing mapping expertise.

The three HEI partners (the Universities of Sunderland, Glasgow and St Andrews) will validate the grant data and link research output (publications) data to projects. The University of Glasgow is also doing some testing with the CERIF XML export option for ePrints.

2.4 RMAS: Research Management and Administrative System

The RMAS[12] project is a collaborative venture between the Universities of Exeter, Kent, and Sunderland to procure, develop and implement a cloud-based research management and administration system. It is funded by JISC on behalf of the Higher Education Funding Council for England (HEFCE). As 'pathfinder institutions' the above Universities have been appointed to implement modules of the solution and to act as demonstrators to the sector. CERIF compliance is required.

A 'pick and mix' set of applications is planned, to cover all the functions associated with the research lifecycle in HEIs. This might include library, HR, student, pre-award, costing, post-award, finance and ethics functions. The cloud based modules should interoperate with local modules eg off the shelf HR systems. A 'Statement of User Requirements' is available. An invitation to tender will be issued and it is planned that initial modules will be in test by March 2012. It is anticipated that several suppliers may work together to cover the key requirements.

2.5 CRIS and repositories

Recognising the importance of interoperability, a number of initiatives have explored the synergies and opportunities for integration between CRIS and institutional repositories. The European Knowledge Exchange CRIS-OAR project[13] produced documentation to support interoperability between CRIS and Open Access Repositories; a second euroCRIS workshop on CRIS, CERIF and institutional repositories was held in Rome in May 2011; and in the UK an RSP event was held in July 2011 to explore the interaction of repositories and CRIS, together with a software exhibition. Other JISC projects, such as RePosit[14] are also working in this area.

2.5.1 Enquire: Enrich and Research Outputs and Impact

As indicated above, the Enquire project[15] at the University of Glasgow was a JISC RIM1 project, but did not use CERIF. Their EPrints-based institutional repository was used to record information about impact for a range of research outputs. Enquire initially used the draft requirements from the RCUK Research Outcomes Project to identify information to capture. Some extra fields were added to allow the EPrints repository to record this data. The project also looked at the RCUK/REF/HEBCIS/University of Glasgow entities and CERIF, and explored the export of impact data to the Medical Research Council's e-Val system.

2.5.2 OpenAIRE

The EU OpenAIRE[16] project has mapped the OpenAIRE data model to CERIF[17]. However the work was carried out over a period of time so the mapping uses an older version of CERIF. The project is working on a solution to enable repositories and CRIS to harvest and expose additional information to publication data via OAI-PMH – such as person, project, event and organisation entities related to publications. The work is based on experience with DIDL for compound objects in the Netherlands and the metadata format developed in the Knowledge Exchange CRIS/OAR project. It is planned to implement the mapping (CERIF-KE format) for experimental export and import of data, in preparation for OpenAIRE+. However the schema will need to be updated to comply with CERIF 2008. OpenAIRE experience has shown that for systems more complicated than repositories and OpenAIRE DC guidelines, individual mappings need to be carried out.

OpenAIRE+ is concerned with linking research data to research publications. euroCRIS is advising on the metadata schema. At the time of writing the project is still in negotiation with the EC, although

scheduled to start in December 2011. It will run in parallel to OpenAIRE and continue into the next framework programme.

3 CERIF CRIS software platforms

There are now several CERIF-compatible CRIS systems available to the UK market. Several companies are involved in RIM and other JISC projects, either directly or indirectly.

- PURE[18] (from Atira, based in Denmark) has emerged as the market leader currently, with a large number of recent acquisitions; the euroCRIS newsflash in June 2011 announced that King's College London, the University of Edinburgh, Aston University and the University of Dundee have all recently acquired PURE. Existing users are St Andrews, Hertfordshire, Lancaster, Aberdeen, Royal Holloway, Strathclyde and York.

- Converis[19] (from Avedas, based in Germany) is used by Cranfield, Hull and Stirling, as well as MRC Oxfordshire Regional Centre.

- Symplectic Elements[20] is UK-based, and still evolving to become a full CRIS. Users include Brunel, Imperial, Queen Mary, Leeds and others.

However despite the potentially large numbers of CRIS users in the UK, many universities are currently at the early stages of deployment.

The newest player in the field is Research in View,[21] a system launched by Thomson Reuters in February 2011. It is a hosted solution, developed in the US, so has some differences to a typical European CRIS. Mapping of Research in View fields to CERIF is being carried out at the time of writing, with advice from euroCRIS. The system is integrated with Web of Science and integration with InCites is underway.

Although all these systems claim to be CERIF compliant, in practice they have varying levels of compliance. None can be considered as fully native CERIF, but are capable of exporting CERIF compliant records. The CERIF Task Group has produced a discussion paper on CERIF compatibility certification; discussions on this are ongoing.

4 Publishers

Some UK institutions have developed automated solutions for importing purchased publications data to their institutional repositories, by contractual agreement with publishers. For example the CRIS vendor Atira wrote a plug-in for their PURE software which allowed the St Andrews University system to ingest publications data from Thomson Reuters (which provides an API that offers data in a proprietary XML format). It is also notable that Thomson Reuters have started to record Research Council funder/grant number in their WoS records.

Thomson Reuters and Elsevier are members of euroCRIS and it seems likely that more publishers will join in the future. Both Thomson Reuters and Elsevier are developing products intended to support research analysis and evaluation more generally. Thomson Reuters new Research in View system has already been mentioned. Elsevier has developed a set of research evaluation tools known as SciVal,[22] while Scopus citation data has been used by the Australian Research Council (ARC) for the Excellence in Research for Australia (ERA) initiative. Elsevier was also a partner with Imperial College London in their JISC RIM1 project[23]. Report recommendations included addressing the lack of data consistency and (perceived) differences in research systems within the UK - this can include publication data as well as other, more metrics-based research information data. Naming/identifier issues are an ongoing problem for integration of distributed publications data from suppliers; for example, although Thomson Reuters and Elsevier could be seen as usefully providing name authority services for publications, each have separate sets of publication identifiers.

5 Research funders

A range of research funders are members of the JISC RIM Group. Funders such as the Wellcome Trust are not currently implementing CERIF although they recognise the facility to share data as

desirable and therefore are keeping a watching brief on CERIF-related development at HEFCE and other organisations.

5.1 HEFCE – Research Excellence Framework

The REF system for data collection (and distribution of data to review panels) has been under development at HEFCE for some time, based on the previous RAE system. The *Assessment framework and guidance on submissions* for the REF was issued in July 2011. The REF submission system will be piloted in September 2012, and go live in December 2012/January 2013.

The framework document states that HEFCE has sought to align the data requirements as far as possible with data reported to other agencies such as HESA and the Research Councils. Also that:

> *The data requirements relating to research outputs will be compatible with the Common European Research Information Format (CERIF). Institutions will be able to import data into the REF submission system in various file formats, enabling them to use existing internal data for preparing REF submissions.* [24]

The file formats for import will include XML files - CERIF is not mentioned specifically but the XML schemas will be made available on the REF website.

The R4R project (as described above) has produced a 'CERIF4REF' XML file format as the potential basis of a core, standard, automated institutional REF return. A revised version was made available in July 2011, designed to make the compilation of CERIF-compliant data for the REF exercise easier.

5.2 Research Councils and the Research Outcomes Project

The original Research Outcomes Project (ROP)[25] had the goal of providing an integrated system for collecting and disseminating all RCUK-funded research. However this plan was withdrawn in summer 2010. Instead four of the Research Councils (ESRC, AHRC, BBSRC and ESRC) will use a system developed by ESRC; MRC and STFC will use e-Val (a new version will be deployed in 2012); and NERC is continuing to use ROD.

All the Research Councils (through the RCUK Information Management Group) are committed to moving towards the use of CERIF as a research information data standard. However this may take some time. The MRC system is CERIF 2003 compliant.

The Research Outcomes blog at the University of Glasgow notes:

> *Discussions between Research Councils about the holy grail of one system are on-going but it may be some time before we have only one or two systems as there are lots of issues for us to work on together.*[26]

A workshop was held in 2010 to investigate the suitability of CERIF 2008 for representing data collected by the Research Councils. It concluded that in the vast majority of cases, the information that Research Councils collect from institutions maps well between Research Councils and could be modelled successfully using CERIF. Certain outputs (such as 'spin off company') are not explicitly modelled in CERIF, but euroCRIS was able to demonstrate how this can be easily accomplished as a role-based time-stamped relationship to the project, or other organisational units and/or persons.

Further work was undertaken looking at mappings between the CERIF4REF XML format (produced by the R4R project) to the data schema developed in ROP. There was found to be a good match regarding descriptions of typical outputs (such as publications), with some non matches (for example regarding encapsulating career development).

6 Other related organisations

6.1 HESA: Higher Education Statistics Agency

In 2010 CERIF and HESA data experts evaluated the extent of overlap between the types of information requested in a HESA return and the information that can be modelled using CERIF 2008. A detailed cross-mapping between the two data models was not attempted. They concluded that although there are some clear overlaps on a few aspects (for example relating to the profiling of an institution's funding sources), attempting to extend CERIF coverage to fully cater for HESA's needs does not look worthwhile in the immediate (or even long) term.

An institution's data about programmes of study and teaching modules are usually stored or administered as part of systems and/or processes separate to the management of research information within institutions, hence there is not a large overlap e.g. between HESA reporting and reporting for the REF. However, where there is overlap (e.g. expressing data about postgraduate students), there is an opportunity for harmonisation. HESA is a member of the REF data collection steering group. Discussions have taken place with HEFCE on alignment and reuse of HESA data for the REF.

6.2 euroCRIS: providing support for CERIF

euroCRIS is the official custodian of CERIF.[27] It supports and promotes CERIF and provides a range of documentation including the standard itself and tutorials. However there is a perceived need for additional introductory documentation. Biannual membership meetings are held as well as a biennial conference (next in June 2012). The core of the work is carried out in Task Groups. Membership fees are low and provide access to additional resources such as draft releases and newsletters as well as meetings and discussion fora. New members are encouraged to attend membership meetings (which include a pre-meeting tutorial), which provide opportunities for participants to share experiences and information. The next membership meeting will be held in Lille in November 2011.

There are now many euroCRIS members in the UK and they are generally willing to support CERIF-related initiatives by discussion or workshop attendance, in the interests of sharing knowledge, experience and good practice. JISC projects have effected modifications to CERIF 2008 in the last year, e.g. changes (including classifications) requested by R4R and CRISPool on behalf of the UK community were approved by the CERIF Task Group and included in the November 2010 release.

The CERIF Task Group is currently working on extensions proposed by users; these include more detail on funding (UK request), facilities and equipment, outcomes and impact (with MICE – see above).

euroCRIS is involved in three new EU projects (including ENGAGE,[28] in which euroCRIS will participate as full partner). Also euroCRIS is now an official advisor to the Russian government for a national CRIS.

7 Directions

7.1 CERIF-CRIS growth in the UK

There is a growing momentum of CERIF-CRIS related activity in the UK, which the JISC Call in July 2011 will further encourage. Despite some frustrations in the UK community over the complexity of the CERIF data model, the wider benefits and efficiency gains for the exchange of data can be recognised. In parallel to the Call JISC is continuing to work with the RIM Group of experts and stakeholders.

As indicated, a number of UK institutions are already actively involved in euroCRIS and recent euroCRIS newsletters have listed many new UK members. At the time of writing there are 30 UK institutional members (next are Germany, Finland and the Netherlands with 6 institutional members each). The growth in membership is running in parallel to the installation of CERIF CRIS software at a number of institutions. Several other institutions are in the process of tendering for systems. Increased UK uptake means that more peer support for CERIF will be available, as well as best practice

guidelines for UK-specific requirements. UK user groups have been established for different software platforms.

CERIF work in the UK to date has been mainly about putting the building blocks in place – proving that mapping is feasible and justifiable, producing demonstrators to show that import/export is viable and would be useful, etc. However there is no major real-world use yet, because the drivers are not there to force institutions to use a complex and resource-intensive standard. There has been relatively little exchange because there are few UK organisations currently in a position to exchange CERIF-based data. Like many other standards initiatives, a critical mass is needed to demonstrate multiple cost benefits. However, as indicated, steady progress on this is being made. The ability to use CERIF for REF submissions will be a further incentive. Therefore the JISC RIM3 focus on the two-way exchange of research information between organisations is of key importance.

7.2 CRIS beyond Europe

There are also indications that RIM/CRIS work is becoming more international in scope. At the euroCRIS board meeting In May 2011 euroCRIS and CASRAI (Consortia Advancing Standards in Research Administration Information) [29] in Canada agreed on collaboration as international partners in a standards-based common platform for research reporting. Cooperation extends to working with NSF and NIH in the US.

CERIF CRIS activity has been growing outside Europe – there are now euroCRIS members in Australia, Canada, China, Iran, Israel, Malaysia, Mexico, South Korea and the US.

8 Acknowledgements

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