

Research Software (RS) Careers

Generic Learnings from King's Digital Lab, King's College London

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Purpose

The role definitions in this document are based on those being piloted in King's Digital Lab. It has been distributed to offer ideas for other eResearch teams across King's College London, the United Kingdom, and internationally. The hope is that sharing the document will increase awareness of the opportunity and need for cohesive approaches to RS careers and increase institutional and community alignment.

Context

This document:

- Aligns to emerging national and international approaches to RS careers, via the UK Research Software Engineering (RSE)¹ Association.²
- Aligns to Software Skills for the Information Age (SFIA) framework.³
- Aligns to industry software development via Agile DSDM[®] framework.⁴

The concepts in this document should work equally well for staff on academic or research contracts. The goal is to provide examples and guidance, and help organisations work towards a cohesive framework, independent of base contracts. It contains three inter-locking components:

- **Role Descriptions:** These are the main position descriptions, which can be used for advertising, hiring, and formal HR role descriptions. Larger teams will have more specialization, while others will only employ RS Engineers.
- **Software Development Lifecycle (SDLC) Roles:** These are based on the Agile DSDM[®] framework and cut across role descriptions. They describe technical roles RS staff might need to perform in the normal course of their day. In many cases staff will perform more than one SDLC role. Larger teams will have more specialization per role.
- **Software Skills for the Information Age (SFIA) Responsibilities & Skills:** These benchmark RS roles against an industry standard and provide a point of connection across to any IT People Strategy.

¹ King's Digital Lab refers to 'Research Software' careers rather than 'Research Software Engineer' careers to allow for specialization (for example 'Research Software Engineer', 'Research Software Analyst', 'Research Software Designer').

² <http://rse.ac.uk/>.

³ <https://www.sfia-online.org/>.

⁴ <https://www.agilebusiness.org/>.

Background

King's Digital Lab (KDL) was established in late 2015, an outgrowth of the Department of Digital Humanities. Our solution to RSE career development is by no means perfect. We're very happy with our role definitions, division of labour, and industry bench-marking, but have defaulted to what might be best described as an 'industry start-up' model to career progression: as Director I know that labour is in very short supply (so am motivated to retain quality staff), the team know budget for senior roles is only available if we perform well as a team (so are motivated to continuously improve our systems, processes, and research outputs), and we manage things year to year in a holistic fashion. It might be that this is the optimal approach for KDL and many other RSE teams, but it is unlikely to work for everyone. At best we can only hope that our career development documents are useful to the wider community and contribute to sector-wide improvement over time.

Role Descriptions

Analyst

Overview

Research Software (RS) analysts perform a similar role to IT business analysts but have a range of skills and attitudes appropriate for working in research-intensive environments. They often have a specialty research domain (based on an advanced degree) that allows them to work closely with Principal Investigators (PIs), and they are likely to have advanced skills in requirements definition and data modelling. Their primary task is to facilitate communication between research and technical teams, requiring them to have a solid knowledge of both domains. They often act as lead project manager as well as analyst, coordinating complex project teams involving researchers and internal and external contributors.

Position Purpose

An RS analyst is the primary point of contact for digital projects assigned to them, from project initiation to closure and maintenance. They work closely with the Principal Investigators (PIs), project managers, developers, and software engineers, to ensure funding proposals are high quality, appropriate research tools and methods are used, technical requirements are well-defined, robust processes are followed, estimates are accurate, and projects are delivered on time and to high scholarly standards. Though technical skills are not a requirement for the role, analysts with such skills may participate in software development where feasible and appropriate. The analyst needs to have experience working with technical teams on complex projects involving computationally intensive research, data modelling & analysis, or web development. They should have excellent research domain knowledge, including an advanced degree, and a solid understanding of digital research tools and methods. They are client facing and consultative in their approach to delivery, and innovative and flexible in their approach to problem solving. It is essential that they have a command of the technical aspects of the role and understand the challenges of producing technical outputs in research-driven higher education environments. RS analysts need to collaborate and communicate with researchers who are often unaware of the processes and technical requirements necessary to produce high quality digital outputs, as well as technical colleagues in IT, industry, and the wider RSE community.

Key Relationships

- Faculties
- eResearch teams.
- IT Directorates.
- Research Management Directorates
- Libraries.
- Assigned academic, laboratory and/or research communities.
- UK RSE community.

Position Duties

Responsibilities	Key Duties	Time %
Research Implementation	<ul style="list-style-type: none"> Produce technical solutions, using tools and methods including but not limited to TEI-XML, high-level programming languages, RDBMS software. 	10%
Research Analysis	<ul style="list-style-type: none"> Deploy existing domain knowledge, or rapidly accumulate more, to understand the computational algorithms, requirements and interfaces involved in a research programming project. Produce solution overview documents, detailing technical requirements, timelines, and cost, suitable for inclusion in funding bids. Work with colleagues across the institution (including both eResearch and IT) to produce ontologies, data models, and documentation to support the production of technical research outputs. 	30%
Project Management	<ul style="list-style-type: none"> Take responsibility for the design and delivery of technical solutions, and their integration into wider institution technical frameworks and strategies. 	20%
Teaching	<ul style="list-style-type: none"> Contribute to training initiatives organized by eResearch teams, including introductory research analysis courses. Provide online and face to face support, and associated documentation, for staff and students using software built or supported by eResearch teams. 	10%
Personal research	<ul style="list-style-type: none"> Develop a personal research agenda, capable of generating external funding, as either PI or Co-I. Contribute to conferences, research papers, and research projects. 	10%
Research Development	<ul style="list-style-type: none"> Work with colleagues across the institution (including both eResearch and IT) to produce technical outputs (code, databases, web applications, databases). 	5%
System, Software, and Data Maintenance & Support	<ul style="list-style-type: none"> Monitor eResearch systems and tools, and patch / upgrade as required to ensure security and performance. Produce technical and end user documentation to aid the use, support, and maintenance of eResearch systems and tools. 	5%
Self-directed learning	<ul style="list-style-type: none"> Maintain and improve skills in research software engineering through independent study and training courses. 	5%

Community outreach	<ul style="list-style-type: none"> • Build or maintain relationships across the UK and international eResearch, eInfrastructure, and RSE communities. • Attend community events such as seminars and workshops. • Contribute expertise to internal and external committees and working groups. • Contribute to department and institution meetings and events. 	5%
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Analyst

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 3.
- SFIA® Skills: BUAN 4; REQM 4; RSCH 4; METL 4; EMRG 4; PRMG 4; DTAN 3; DESN 4; INCA 3; UNAN 4; RELM 3; TEAC 5.

SDLC Roles

In addition to the core position duties, RS analysts are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal skillset:

- Research Analyst.
- Project Coordinator.
- Tester.
- Team Leader.
- Research Developer.

Person specification

Essential Skills

- Ability to communicate with Principal Investigators (PIs) at a professional research level, to ensure their research vision and/or research questions are supported;
- Excellent written and verbal skills, and experience communicating technical information to lay audiences;
- Advanced degree in any research field, or equivalent professional experience working in a research & development role (academic or industry);
- Significant expertise in requirements analysis for research-related technical solutions;
- Understanding of software design & testing, and software engineering best practice;
- Demonstrable experience translating complex research questions into technically tractable solutions;
- Experience applying the fundamentals of database modelling and design to research-related problems;
- Understanding of Research Data Management (RDM) best practice;
- Motivation to keep up to date with new and emerging technologies;
- Ability to work both unsupervised and as part of a team.

Domain Specific Skills

The following skills may be useful, depending on research and operational contexts:

- Skills in one programming language (for example Python, C++, C#, Java, Fortran 2003);
- Knowledge of a technical computing specialism (metadata analysis, text analysis, corpus linguistics, machine learning, parallel programming, Map Reduce, semantic web etc);
- A solid understanding of the higher education and research sectors;
- An understanding of High Performance Computing (HPC), including the UK HPC environment;
- Experience working with research software engineering teams and/or contributing to research through software development;
- Experience working in a service-oriented environment;
- Awareness of commonly used software development best practices (Agile, RUP etc);
- Awareness of accepted IT industry frameworks (ITIL, PRINCE2, SOFIA etc).

Senior Analyst

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 4.
- SFIA® Skills: BUAN 5; REQM 5; RSCH 5; METL 5; EMRG 5; PRMG 5; DTAN 4; DESN 5; INCA 4; UNAN 4; RELM 3; TEAC 5; PDSV 4; PEMT 4.

In addition to the roles and responsibilities undertaken by the RS Analyst, a RS Senior Analyst is expected to be able to fulfil the following objectives:

- Manage teams of up to 5 people;
- Act as lead analyst on £1 million+ projects;
- Contribute to appropriate international scholarly networks;
- Lead the production of major grant proposals with multiple stakeholders;
- Taking line management responsibilities for up to 5 staff (Performance Development & Review);
- Leading lab strategy related to management of the Software Development Life (SDLC) and other associated processes;
- Identify methodologies, tools, and techniques that will support analysis functions within the lab;
- Lead the definition of analysis-related standards;
- Develop strategies to remain ahead of the latest technologies;
- Demonstrate deep knowledge of several digital research tools & methods;
- Demonstrate experience leading major technical research projects.

Principal Analyst

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 5.
- SFIA® Skills: BUAN 6; REQM 6; RSCH 6; METL 6; EMRG 6; PRMG 6; DTAN 5; DESN 5; INCA 5; UNAN 4; RELM 3; TEAC 5; PDSV 5; PEMT 5.

In addition to the roles and responsibilities undertaken by the RS Senior Analyst, a RS Principal Analyst is expected to be able to fulfil the following objectives:

- Take line management responsibilities for up to 10 staff (Performance Development & Review);
- Attend national and international conferences, presenting technical details of research outputs;
- Collaborate with development teams at major commercial IT companies;
- Take a lead role in international research-related software development networks;
- Initiating and leading research grant proposals related to personal research.

Project Manager

Overview

Research Software Engineering (RSE) Project Managers are client facing and consultative in their approach to delivery - working, leading and driving the technical team whilst managing expectations. They have a deep understanding of research funding sources and processes, and reporting requirements, and experience with industry project management frameworks such as Agile DSDM® and PRINCE2. They act as key points of contact between research funding agencies, Principal Investigators, RS team-members, eResearch, Research Management Directorates, Library, and IT. They are likely to be involved in event management, and coordinate training and seminar series, but are primarily responsible for ensuring the smooth definition, administration, and coordination of technical research projects. They are likely to be involved in procurement processes, with external specialist teams.

Project Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 3.
- SFIA® Skills: BUAN 3; INAN 3; ITCM 4; PRGM 4; PROF 3; REQM 2; RLMT 4; SLMO 4; SORC 3.

Position Purpose

Research Software (RS) project managers are responsible for financial, resourcing, and project management of internally and externally funded projects, working closely with and reporting to the Principal Investigators (PIs), and professional services staff in faculties / divisions, the library, and IT. A key element of the role is to put in place and implement industry standard project management frameworks to ensure operational efficiency, financial stability, and risk management, and monitoring of progress against stated objectives and targets. The post requires experience managing projects, and deep knowledge of research funding sources and processes in the UK and European HE sector. Experience working in software engineering environments, controlling Software Development Lifecycles (SDLC), and tendering / procurement, is highly beneficial.

Key Relationships

- Faculties
- eResearch teams.
- IT Directorates.
- Research Management Directorates
- Libraries.
- Assigned academic, laboratory and/or research communities.

UK RSE community

Position Duties

Responsibilities	Key Duties	Time %
Project Management	<ul style="list-style-type: none"> • Act as the key point of contact between research funding agencies, Principal Investigators, RS team-members, eResearch, Research Management Directorates, Library, and IT. • Take responsibility for the design and delivery of technical solutions by RS and/or IT teams, and their integration into wider institution technical frameworks and strategies. • Provide itemized cost estimates for technical solutions suitable for inclusion in funding bids, either directly or through RS colleagues. • Collate and disseminate research funding data, along with evaluation, measurement & impact metrics. • Manage teams of technical RS staff across the institution involved in the design, development, and delivery of eResearch solutions. 	60%
Process Analysis	<ul style="list-style-type: none"> • Work with colleagues across the institution (including Faculties / Divisions, eResearch, Research Management Directorates, Library, and IT) to ensure processes for RS and related funding / applications are detailed and effective. 	5%
Research Analysis	<ul style="list-style-type: none"> • Work with colleagues across KCL (including Faculties / Divisions, eResearch, Research Management Directorates, Library, and IT) to define requirements for research-related technical solutions. 	5%
Teaching / Research	<ul style="list-style-type: none"> • Organise training initiatives organized by the institution eResearch, including introductory programming and software courses. • Coordinate online and face to face support, and associated documentation, for staff and students using software built or supported by eResearchers. • Develop a personal research agenda, contributing to conferences, blog posts and/or research articles and other outputs. 	10%
System, Software, and Data Maintenance & Support	<ul style="list-style-type: none"> • Manage staff involved in the maintenance of eResearch systems and tools and ensure patches / upgrades are implemented as required to ensure security and performance. • Manage staff involved in the production of technical and end user documentation to aid the use, support, and maintenance of eResearch systems and tools. 	10%

Self-directed learning	<ul style="list-style-type: none"> Maintain and improve skills in research software engineering project management through independent study and training courses. 	5%
Community outreach	<ul style="list-style-type: none"> Build or maintain relationships across the UK and international eResearch, eInfrastructure, and RSE communities. Attend community events such as seminars and workshops. Contribute expertise to internal and external committees and working groups. Contribute to department and institution meetings and events. 	5%

SDLC Roles

In addition to the core position duties, RS project managers are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal skillset:

- Project Coordinator.
- Tester.
- Analyst.

Person specification

Essential Skills

- An industry qualification in Project Management (PRINCE2, Agile DSDM, PMBOK etc);
- A solid understanding of the higher education and research sectors;
- Experience providing data and reports in an HE context;
- Ability to communicate with Principal Investigators (PIs) and professional services management, to ensure their requirements (research & administrative) are supported;
- Excellent written and verbal skills, and experience communicating technical information to lay audiences;
- Advanced degree in any research field, or equivalent professional experience working in a research & development role (academic or industry);
- Demonstrable experience delivering complex technical projects on time and budget;
- Understanding of Research Data Management (RDM) best practice;
- Motivation to keep up to date with new and emerging project management methods;
- Ability to work both unsupervised and as part of a team.

Domain Specific Skills

The following skills may be useful, depending on research and operational contexts:

- Significant expertise in project management of research software engineering teams;
- Understanding of software design & testing, and software engineering best practice;
- An understanding of High Performance Computing (HPC), including the UK HPC environment;

- Experience working with HE, commercial, or government IT teams;
- Experience working in a service-oriented environment;
- Awareness of commonly used software development best practices (Agile, RUP etc);
- Awareness of accepted IT industry frameworks (ITIL, PRINCE2, SOFIA etc).

Senior Project Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 4.
- SFIA® Skills: BUAN 3; INAN 4; ITCM 5; PRGM 5; PROF 4; REQM 2; RLMT 5; SLMO 5; SORC 4.

In addition to the roles and responsibilities undertaken by the RS Project Manager, a RS Senior Project Manager is expected to be able to fulfil the following objectives:

- Line manage up to 5 Research Software staff;
- Lead cross-functional teams comprising eResearch, Research Management Directorates, IT, and Library staff on university-wide projects;
- Contribute to national and international standards for management of RS projects;
- Contribute industry talks, blog posts, and social media to improve the impact of eResearch;
- Mentor postgraduate students / fellows and postdoctoral fellows, and help them align to eResearch best practice guidelines;
- Maintain an international profile as an RS project manager, contributing to research papers, blog posts, conference papers, and/or scholarly open source projects;
- Contribute to appropriate international scholarly networks.

Principal Project Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 5.
- SFIA® Skills: BUAN 3; INAN 5; ITCM 6; PRGM 6; REQM 2; RLMT 6; PROF 5; SLMO 6; SORC 5.

In addition to the roles and responsibilities undertaken by the RS Senior Project Manager, a RS Principal Project Manager is expected to be able to fulfil the following objectives:

- Line manage up to 10 Research Software staff;
- Attend national and international conferences, presenting details of technical and where appropriate research outputs;
- Collaborate with development teams in commercial IT companies, and government departments;
- Lead the development of national and international standards for management of RSE projects;
- Lead teams producing high quality code to the open source community, to improve the impact of eResearch;
- Take a lead role in international research-related RS networks;
- Initiate and lead research grant proposals related to personal research.

Software Engineer

Overview

Research Software (RS) Engineers can work in a variety of different research domains, and in a variety of different teams. They are flexible technical specialists capable of designing and programming high quality research solutions (from algorithms to web applications), and often have significant domain knowledge. They can work alone, with minimal supervision, or as part of large research projects or software engineering teams. They are expected to contribute to the development of eResearch capability in their immediate department, research group, or laboratory as well as across the university, and be aware of best practices in software development, digital research methods, and data management.

Position Purpose

A RS engineer's primary task is to produce high quality code to support product specifications and requirements defined in collaboration with research leads and (where applicable) other members of their RS team. They are expert in at least one programming language, have solid proficiency in others, and a deep interest in software development generally. They are often capable of full stack development, from the operating system, through database, application layer, and user interface, but might have one or more technical specialties such as machine learning, parallel programming, or web development. They have a deep commitment to producing high quality code and keep up to date with the latest technical innovations. They often have deep knowledge of a research domain and contribute to research projects on an intellectual as well as technical level. RS engineers are integral to the production of software code, systems architectures, and associated design patterns. It is essential that they have a command of these technical aspects of the role but understand the challenges of producing code in research-driven higher education environments. RS engineers need to collaborate and communicate with researchers who are often unaware of the processes and technical requirements necessary to produce high quality digital outputs, as well as technical colleagues in IT, industry, and the wider RS community.

Key Relationships

- Faculties
- eResearch teams.
- IT Directorates.
- Research Management Directorates
- Libraries.
- Assigned academic, laboratory and/or research communities.

UK RSE community

Position Duties

Responsibilities	Key Duties	Time %
Research Implementation	<ul style="list-style-type: none"> Work with colleagues across the institution to produce code, technical frameworks, user interfaces, and systems for modelling, analysis, storage, presentation, and simulation of research-intensive problems (and dissemination of results). 	30%
Research Analysis	<ul style="list-style-type: none"> Deploy existing domain knowledge, or rapidly accumulate more, to understand the computational algorithms, requirements and interfaces involved in a research programming project. Work with colleagues across the institution (including both eResearch and IT) to define requirements for research-related technical solutions. 	20%
Project Management	<ul style="list-style-type: none"> Take responsibility for the design and delivery of technical solutions, and their integration into wider technical frameworks and strategies. Provide itemized cost estimates for technical solutions suitable for inclusion in funding bids. 	10%
Teaching	<ul style="list-style-type: none"> Contribute to training initiatives organized by eResearch or their local Faculty or Department, including introductory programming and software courses. Provide online and face to face support, and associated documentation, for staff and students using software built or supported by eResearch. 	10%
Personal research	<ul style="list-style-type: none"> Develop a personal research agenda, capable of generating external funding, as either PI or Co-I. Contribute to conferences, research papers, and research projects. 	10%
System, Software, and Data Maintenance & Support	<ul style="list-style-type: none"> Monitor eResearch systems and tools, and patch / upgrade as required to ensure security and performance. Produce technical and end user documentation to aid the use, support, and maintenance of eResearch systems and tools. 	10%
Self-directed learning	<ul style="list-style-type: none"> Maintain and improve skills in research software engineering through independent study and training courses. 	5%
Community outreach	<ul style="list-style-type: none"> Build or maintain relationships across the UK and international eResearch, eInfrastructure, and RSE communities. Attend community events such as seminars and workshops. 	5%

	<ul style="list-style-type: none"> • Contribute expertise to internal and external committees and working groups. • Contribute to department and institution wide meetings and events. 	
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Software Engineer

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 3.
- SFIA® Skills: BUAN 3; HVEC 3; REQM 3; RSCH 3; METL 4; TECH 4; EMRG 4; ARCH 5; DESN 4; DTAN 3; DBDS 3; PROG 3; RELM 4; TEST 3; PDSV 4; UNAN 4; USEV 3.

SDLC Roles

In addition to the core position duties, RS engineers are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal skillset:

- Developer.
- Tester.
- Analyst.

Person specification

Essential Skills

- Advanced degree in a computationally intensive field, or equivalent professional experience working in a research & development role (academic or industry);
- Advanced skills in one programming language (for example Python, C++, C#, Java, Fortran 2003) and conversant with one or two more;
- Significant expertise in at least one technical computing specialism (machine learning, parallel programming, Map Reduce, semantic web etc);
- Experience applying the fundamentals of database modelling and design to research-related problems;
- Understanding of requirements analysis, software design & testing, and software engineering best practice;
- Confidence using Unix-based operating systems, and Unix-based system administration;
- Ability to communicate with Principal Investigators (PIs) at a professional research level, to ensure their research vision and/or research questions are supported;
- Understanding of Research Data Management (RDM) best practice;
- Excellent written and verbal skills, and experience communicating technical information to lay audiences;
- Motivation to keep up to date with new and emerging technologies;
- Ability to work both unsupervised and as part of a team;
- Experience of processes within Higher Education.

Domain Specific Skills

The following skills may be useful, depending on research and operational contexts:

- Experience with the advanced use of high-level dynamic languages for numerically-intensive research, preferably Python, Julia, or R;
- Advanced knowledge of applied mathematics;
- A solid understanding of the higher education and research sectors;
- Demonstrable experience of producing high quality code to support product specifications and requirements (including through contributions to open source projects);
- An understanding of High Performance Computing (HPC), including the UK HPC environment;
- Experience working with research software engineering teams and/or contributing to research through software development;
- Experience working in a service-oriented environment;
- Awareness of commonly used software development best practices (Agile, RUP etc);
- Awareness of accepted IT industry frameworks (ITIL, PRINCE2, SOFIA etc).

Senior Software Engineer (Grade 7)

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 4.
- SFIA® Skills: BUAN 4; HVEC 3; REQM 4; RSCH 4; METL 5; TECH 5; EMRG 5; SPIM 5; ARCH 5; DESN 5; DLMG 5; DTAN 4; DBDS 4; PROG 4; RELM 5; TEST 4; PDSV 5; PEMT 4; UNAN 4; USEV 3.

SDLC Roles

In addition to the core position duties, Senior RS engineers are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal set of skills:

- Developer.
- Tester.
- Analyst.
- Team Leader.

In addition to the roles and responsibilities undertaken by the RS Engineer, a Senior RS Engineer is expected to be able to fulfil the following objectives:

- Manage up to 5 team members;
- Contribute to national and international standards for research-driven development / practice-led research;
- Contribute high quality code to the open source community, improving the impact of eResearch;
- Attend national and international conferences, presenting technical details of technical and where appropriate research outputs;
- Mentor postgraduate students / fellows and postdoctoral fellows, and help them align to eResearch best practice guidelines;
- Maintain an international profile as a research software engineer, contributing to research papers, blog posts, conference papers, and/or scholarly open source projects;
- Initiate and lead research grant proposals related to personal research;

- Contribute to appropriate international scholarly networks.

Principal Software Engineer

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 5.
- SFIA® Skills: BUAN 5; HVEC 3; REQM 5; RSCH 5; METL 6; TECH 6; EMRG 6; SPIM 6; ARCH 6; DLMG 6; DESN 6; DTAN 4; DBDS 5; PROG 5; RELM 5; TEST 5; PDSV 5; PEMT 5; UNAN 4; USEV 3.

SDLC Roles

In addition to the core position duties, Principal RS engineers are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal set of skills:

- Technical Coordinator.
- Technical Advisor.
- Developer.
- Tester.
- Team Leader.
- Analyst.

In addition to the roles and responsibilities undertaken by the Senior RS Engineer, a Principal RS Engineer is expected to be able to fulfil the following objectives:

- Manage up to 10 team members;
- Take responsibility for the security, maintainability and generally quality of the software products produced in their assigned research community;
- Attend national and international conferences, presenting technical details of technical and where appropriate research outputs;
- Collaborate with development teams at commercial IT companies;
- Lead teams producing high quality code to the open source community, to improve the impact of eResearch;
- Take responsibility for choosing the technologies, languages and tools that the lab works with;
- Contribute to international research-related software development networks;
- Contribute to the planning and development of other eResearch labs;
- Initiate and lead research grant proposals related to personal research;
- Oversee the entire development cycle, from initial designs to delivery;
- Recruit and evaluates new hires.

Systems Manager

Overview

Research Software (RS) Systems Managers are responsible for core eResearch infrastructure, both technical and physical. They are responsible for security and work closely with the technical development teams to manage costs, produce estimates, and define Service Level Agreements. They are a key point of communication to IT, including the Research Solutions team, and often manage or provide access to local and national High Performance Computing (HPC) systems.

Position Purpose

An RS Systems Manager supports the infrastructure and systems that enable digital publishing and computationally intensive research. They are experts in the technical implementation and maintenance, and capacity management, of local and cloud computing infrastructure, and often have expertise managing High Performance Computing (HPC) environments. They work closely with laboratory managers, technicians, software development teams, and IT professionals. They hold important relationships with IT regarding physical and virtual hardware, and networking. They often liaise with external contractors and vendors and might engage with finance and procurement teams. They are responsible for the security of systems, and sometimes sensitive research data. Depending on their team, RS Systems Managers are sometimes responsible for managing software licenses and might liaise with Estates regarding physical space. They might also manage general laboratory assets including desktop computers with non-standard operating systems of various kinds, and other technical equipment including digital scanners and 3D printers. Some might also have responsibility for Portable Appliance Testing (PAT) and fire safety.

Key Relationships

- Faculties
- eResearch.
- IT Research Solutions.
- IT.
- Assigned academic, laboratory and/or research communities.
- UK RSE community.
- Estates.
- Library.
- External vendors and consultants.

Position Duties

Responsibilities	Key Duties	Time %
System, Software, and Data Maintenance & Support	<ul style="list-style-type: none"> • Work with colleagues across the institution to implement, maintain and capacity manage infrastructure & systems that support publication, modelling, analysis, and simulation of research-intensive problems (and dissemination of results). 	60%

	<ul style="list-style-type: none"> • Monitor eResearch systems and tools, and patch / upgrade as required to ensure security and performance. • Produce technical and end user documentation to aid the use, support, and maintenance of eResearch systems and tools. 	
Research Analysis	<ul style="list-style-type: none"> • Deploy existing domain knowledge, or rapidly accumulate more, to understand infrastructure and systems requirements for research-intensive activities. • Work with colleagues across the institution. (including both eResearch and IT) to define requirements for research-related technical solutions. 	10%
Project Management	<ul style="list-style-type: none"> • Take responsibility for the design and delivery of technical solutions, and their integration into wider College technical frameworks and strategies. • Provide itemized cost estimates for technical solutions suitable for inclusion in funding bids, and liaise with finance and procurement teams as needed. 	10%
Lab management	<ul style="list-style-type: none"> • Maintain asset registries and software licenses, liaise with Estates and fire officers, conduct PAT testing, maintain technical equipment. 	5%
Personal research	<ul style="list-style-type: none"> • Develop a personal research agenda, capable of generating external funding, as either PI or Co-I. • Contribute to conferences, research papers, and research projects. 	5%
Self-directed learning	<ul style="list-style-type: none"> • Maintain and improve skills in research software engineering through independent study and training courses. 	5%
Community outreach	<ul style="list-style-type: none"> • Build or maintain relationships across the UK and international eResearch, eInfrastructure, and RSE communities. • Attend community events such as seminars and workshops. • Contribute expertise to internal and external committees and working groups. • Contribute to department and institution-wide meetings and events. 	5%

Systems Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 3.
- SFIA® Skills: ARCH 5; ASMG 4; AVMT 4; CHMG 4; CNSL 5; COPL 4; CPMG 4; DATM 2; DBAD 2; DCMA 3; DESN 3; EMRG 4; HSIN 3; ITMG 5; ITOP 3; METL 4; NTAS 3; NTDS 5; NTPL 5; PORT 3; PRGM 4; SCAD 5; SCTY 4; SEAC 4; SINT 3; SLMO 3; STMG 4; STPL 5; SYSP 4; TECH 4; TEST 2.

SDLC Roles

In addition to the core position duties, an RS Systems Manager also contributes to the following Agile SDLC roles:

- Technical Advisor.
- Tester.

Person specification

Essential Skills

- Advanced degree in a computationally intensive field, or equivalent professional experience working in a research & development role (academic or industry);
- Significant expertise managing enterprise-scale computing infrastructure / systems;
- Confidence using Unix-based operating systems, and Unix-based system administration;
- Advanced understanding of systems security, networking, virtualization, containerization, and database technologies.
- Skills in at least one programming language (for example Python, C++, C#, Java, Fortran 2003);
- An understanding of High Performance Computing (HPC), including the UK HPC environment;
- Understanding of requirements analysis, software design & testing, and software engineering best practice;
- Ability to communicate effectively with research software engineering teams, administrators, and IT professionals, to ensure their requirements are supported;
- Understanding of Research Data Management (RDM) best practice;
- Excellent written and verbal skills, and experience communicating technical information to lay audiences;
- An understanding of DevOps and Continuous Integration;
- Motivation to keep up to date with new and emerging technologies;
- Ability to work both unsupervised and as part of a team.

Domain Specific Skills

The following skills may be useful, depending on research and operational contexts:

- Experience with the advanced use of high-level dynamic languages for numerically-intensive research, preferably Python, Julia, or R;
- Experience implementing DevOps;
- Advanced knowledge of applied mathematics;

- A solid understanding of the higher education and research sectors;
- Experience implementing and/or maintaining and providing access to High Performance Computing (HPC) systems;
- Demonstrable experience of implementing and/or maintaining high quality research infrastructure);
- Experience working with research software engineering teams and/or contributing to research through software development;
- Experience working in a service-oriented environment;
- Awareness of commonly used software development best practices (Agile, RUP etc);
- Awareness of accepted IT industry frameworks (ITIL, PRINCE2, SOFIA etc).

Senior Systems Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 4.
- SFIA® Skills: ARCH 5; ASMG 5; AVMT 5; CHMG 5; CNSL 5; COPL 4; CPMG 5; DATM 2; DBAD 3; DCMA 4; DESN 4; EMRG 5; HSIN 4; ITMG 6; ITOP 4; METL5; NTAS 3; NTDS 5; NTPL 6; PEMT 4; PDSV 4; PORT 4; PRGM 5; SCAD 6; SCTY 5; SEAC 4; SINT 4; SLMO 4; STMG 5; STPL 6; SYSP 5; TECH 5; TEST 3.

In addition to the roles and responsibilities undertaken by the RS Systems Manager, a RS Senior Systems Manager is expected to be able to fulfil the following objectives:

- Manage up to 2 systems managers;
- Work with finance and procurement teams to cost and procure major infrastructure implementations (>£250,000).
- Take responsibility for the security, maintainability, and generally quality of the systems infrastructure produced in their assigned research community;
- Contribute to national and international standards for research-driven eResearch infrastructure;
- Maintain an international profile as an RS Systems Manager, contributing to research papers, blog posts, conference papers, and/or scholarly open source projects;
- Contribute to appropriate international scholarly networks.

Principal Systems Manager

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 5.
- SFIA® Skills: ARCH 5; ASMG 6; AVMT 5; CHMG 5; CNSL 5; COPL 4; CPMG 5; DATM 2; DBAD 3; DCMA 5; DESN 5; EMRG 5; HSIN 5; ITMG 6; ITOP 4; METL 6; NTAS 3; NTDS 5; NTPL 6; PEMT 5; PDSV 5; PORT 5; PRMG 6; SCAD 6; SCTY 6; SEAC 4; SINT 5; SLMO 5; STMG 6; STPL 6; SYSP 5; TECH 6; TEST 3.

In addition to the roles and responsibilities undertaken by the RS Senior Systems Manager, a Principal Systems Manager is expected to be able to fulfil the following objectives:

- Manage up to 5 developers;

- Work with finance and procurement teams to cost and procure major infrastructure implementations (>£500,000).
- Attend national and international conferences, presenting technical details of technical and where appropriate research outputs;
- Collaborate with systems infrastructure teams at commercial IT companies;
- Lead the development of national and international standards for research-driven development / practice-led research;
- Lead teams producing high quality code to the open source community, to improve the impact of eResearch;
- Take a lead role in international research-related software engineering networks;
- Initiate and lead research grant proposals related to personal research.

UI / UX Designer

Overview

Research Software (RS) UI/UX Designers work in a variety of different research domains, and in a variety of different teams. The RS UI/UX Designer is responsible for project research, development of user journeys, concepts development, design and front-end development of web tools and online projects. They work closely with analysts and software engineers to develop and implement information architecture across projects and produce a fully functional product. Their focus is on innovation, impact, and public engagement, pushing the boundaries while respecting industry standards and accessibility. Their goal is to produce products of the highest design quality possible within the available budget, and with attention to best practice in research methods, visualization, and digital publishing. They are expected to contribute to the development of eResearch capability in their immediate department, research group, or laboratory as well as across the university, and be aware of best practices in software development, digital research methods, data visualization, and data management.

Position Purpose

RS UI/UX Designers work with analysts, developers, clients, and stakeholders throughout the research process from concept development to technical delivery. They develop requirements and evaluate the technical feasibility of different development approaches, and then implement them in partnership with technical teams. They often work with institutional brand specialists, and external design teams. They have strengths with industry design products such as Adobe Creative Suit (or equivalent) software, and solid technical understanding of HTML, CSS, Javascript and/or relevant technical frameworks. Their emphasis on design or technical development will vary from person to person and team to team. They are focused on maximizing both the end user experience, and the impact and quality of digital research publications. An understanding of database design, data analysis, and visualization is becoming increasingly important, along with an ability to present information in a readable and transparent manner.

Key Relationships

- Faculties
- eResearch.
- IT Research Solutions.
- Research Management Directorates.
- Library.
- Assigned academic, laboratory and/or research communities.
- UK RSE community.

Position Duties

Responsibilities	Key Duties	Time %
Research Development	<ul style="list-style-type: none"> • Work with colleagues across the institution to produce design artefacts, information architecture, interfaces, visualizations, code, technical frameworks 	40%

	and systems for modelling, analysis, and simulation of research-intensive problems (and dissemination of results),	
Research Analysis	<ul style="list-style-type: none"> • Work with colleagues across the institution (including eResearch, Library, and IT) to define requirements for research-related technical solutions. • Deploy existing domain knowledge, or rapidly accumulate more, to understand the computational algorithms, requirements and interfaces involved in a research programming project, and contribute appropriate design assets to the development effort. 	15%
Project Management	<ul style="list-style-type: none"> • Take responsibility for the delivery of design assets, visualizations, code, and interface components, and their integration into wider institutional technical frameworks and strategies. • Provide itemized cost estimates for design solutions suitable for inclusion in funding bids. 	10%
Teaching	<ul style="list-style-type: none"> • Contribute to training initiatives organized by eResearch, including introductory UI/UX design courses. • Provide online and face to face support, and associated documentation, for staff and students using software built or supported by eResearch. 	10%
Personal research	<ul style="list-style-type: none"> • Develop a personal research agenda, capable of generating external funding, as either PI or Co-I. • Contribute to conferences, research papers, and research projects. 	10%
System, Software, and Data Maintenance & Support	<ul style="list-style-type: none"> • Produce technical and end user documentation to aid the use, support, and maintenance of eResearch systems and tools. 	5%
Self-directed learning	<ul style="list-style-type: none"> • Maintain and improve skills in research software engineering through independent study and training courses. 	5%
Community outreach	<ul style="list-style-type: none"> • Build or maintain relationships across the UK and international eResearch, eInfrastructure, and RSE communities. • Attend community events such as seminars and workshops. • Contribute expertise to internal and external committees and working groups. • Contribute to department and institution wide meetings and events. 	5%

UI / UX Designer

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 5.
- SFIA® Skills: BUAN 4; HCEV 4; INAN 4; REQM 3; RSCH 2; METL 4; TECH 4; EMRG 4; ARCH 5; DESN 4; DTAN 4; DBDS 3; PROG 3; TEST 3; UNAN 4; USEV 4.

SDLC Roles

In addition to the core position duties, RS UI/UX designers are also likely to contribute to the following Agile Software Development Lifecycle (SDLC) roles (see Appendix A), depending on their personal skillset:

- Developer.
- Tester.
- Analyst.
- Team Leader.

Person specification

Essential Skills

- Advanced degree in a design or computing intensive field, or equivalent professional experience working in a research & development role (academic or industry);
- Advanced skills in either a front-end programming language (html, CSS, JavaScript) or graphic design or data visualization. A combination of all three, with varying degrees of proficiency, is optimal.
- Significant expertise in designing user interfaces and visualizations for research-intensive products;
- An interest in Human Psychology and Human Behaviour;
- An understanding of the fundamentals of database modelling and design, and their application to research-related problems;
- An understanding of requirements analysis, software design & testing, and software engineering best practice;
- Ability to communicate with Principal Investigators (PIs) at a professional research level, to ensure their research vision and/or research questions are supported;
- Ability to communicate with University brand and marketing team members;
- Understanding of Research Data Management (RDM) best practice;
- Excellent written and verbal skills, and experience communicating technical information to lay audiences;
- Motivation to keep up to date with new and emerging technologies;
- Ability to work both unsupervised and as part of a team.

Domain Specific Skills

The following skills may be useful, depending on research and operational contexts:

- A solid understanding of the higher education and research sectors;
- Demonstrable experience of producing high quality code or design assets to support product specifications and requirements (including through contributions to open source projects);
- Experience using GitHub or comparable version control tools;
- An understanding of High Performance Computing (HPC), including the UK HPC environment;
- Experience working with research software engineering teams and/or contributing to research through software development;
- Experience working in a service-oriented environment;
- Awareness of commonly used software development best practices (Agile, RUP etc);
- Awareness of accepted IT industry frameworks (ITIL, PRINCE2, SOFIA etc).

Senior UI / UX Designer

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 4.
- SFIA® Skills: BUAN 5; HCEV 5; INAN 5; REQM 4; RSCH 3; METL 5; TECH 5; EMRG 5; ARCH 5; DESN 5; DTAN 5; DBDS 3; PEMT 4; PDSV 4; PROG 4; TEST 4; UNAN 5; USEV 5.

In addition to the roles and responsibilities undertaken by the UI/UX Designer, a Senior UI/UX Designer is expected to be able to fulfil the following objectives:

- Manage up to 5 RS UI/UX Designers;
- Ensure business implications of day-to-day design decisions are properly thought through;
- Set brand and communications standards in consultation with appropriate institutional teams;
- Contribute to appropriate international scholarly networks;
- Evaluate the feasibility of project proposals from a design perspective;
- Coordinate design and delivery of UI/UX elements with internal and external delivery teams;
- Provide technical expertise to analysts in the writing of bids, grant proposals, conference papers and other research products;
- Be visible in the eResearch community, appearing at conferences, running workshops and seminars;
- Produce code and conceptual approaches that are of use to the wider eResearch community and release them through GitHub, blog posts, and articles;
- Conduct outreach to the wider faculty and college community on opportunities for collaboration with the lab.

Principal UI / UX Designer

Skills Framework for the Information Age (SFIA) alignment:

- SFIA® Level of Responsibility 3.
- SFIA® Skills: BUAN 5; HCEV 6; INAN 5; REQM 4; RSCH 4; METL 6; TECH 6; EMRG 6; ARCH 6; DLMG 5; DESN 6; DTAN 6; DBDS 4; PEMT 5; PDSV 5; PROG 5; TEST 4; UNAN 6; USEV 6.

In addition to the roles and responsibilities undertaken by the Senior RS UI/UX Designer, a Principal RS UI/UX Designer is expected to be able to fulfil the following objectives:

- Take line management responsibilities for up to 10 staff (Performance Development & Review);
- Attend national and international conferences, presenting technical details of eResearch outputs;
- Collaborate with development teams at major commercial IT companies;
- Take a lead role in international research-related software development networks;
- Initiating and leading research grant proposals related to personal research.

Appendix A: Software Development Lifecycle (SDLC) Roles

The following SDLC roles have been adapted from the Agile DSDM® methodology. They augment core RSE HR positions, allowing flexibility in delivery and team composition, and are used within rather than across projects. RSE staff might perform multiple SDLC roles. Medium and large projects will often require greater specialization. KDL staff are encouraged to undertake Agile DSDM® training in their first year of work.

Project Coordinator

- Ensuring effective and timely communication and provision of information to project governance authorities (Principal Investigator, project advisory board, steering committee etc.) and stakeholders not actively engaged in the project with the agreed and appropriate level of frequency and formality;
- Performing high-level project planning and scheduling, but not detailed timebox planning or task planning;
- Collaborating with the solution development team and/or other appropriate stakeholders to create and agree the delivery plan (the schedule of project increments and the timeboxes within them);
- Monitoring progress against the baselined delivery plan;
- Managing risk and any issues as they arise, collaborating with senior analytical or technical roles as required to resolve them;
- Motivating and ensuring empowerment of the teams to meet their objectives;
- Monitoring and ensuring appropriate involvement and communication between required members of the multi-disciplinary solution development team and/or other appropriate stakeholders;
- Handling problems escalated from the solution development team and/or other appropriate stakeholders;
- Providing help and guidance to the solution development team and/or other appropriate stakeholders where difficult situations arise;
- Attending stand-up meetings, as appropriate, to keep a current understanding of the team's progress and issues, and to flag up to the team, where necessary, any important external issues that the team need to be aware of.

Technical Coordinator

- Agreeing and controlling the technical architecture;
- Determining the technical environments;
- Advising on and coordinating each team's technical activities;
- Identifying and owning architectural and other technically based risks;
- Advising on the achievability of non-functional requirements;
- Working with colleagues to evaluate the technical options and decide the best way to turn the high-level research requirements into a technical solution;
- Advising on and coordinating each team's approach to estimating, to reflect technical best practice and current technical understanding;
- Promoting appropriate standards of technical best practice;
- Controlling the technical configuration of the research projects;

- Approving the research projects as technically fit for purpose prior to deployment;
- Managing technical aspects of the transition of the solution into live use;
- Empowering the technical roles within the team to appropriate levels within their responsibilities;
- Acting as the final arbiter of technical differences between team members.

Analyst

- Assisting the principal project stakeholders in the formulation and promotion of the research vision, as appropriate;
- Modelling the field's current and future state in the area of the solution and identifying opportunities, risks and impacts;
- Working with the principal project stakeholders and the solution development team and/or other appropriate stakeholders to formulate and communicate solution options;
- Working with the project-level roles in formulating design documents and benefits assessment;
- Supporting and facilitating unambiguous and timely communication between scholarly and technical participants in the project;
- Ensuring the requirements defined are of good quality and are analysed and managed appropriately;
- Managing development, distribution and baseline approval of all communication; related to requirements and their interpretation, with particular focus on ensuring the prioritised requirements list is kept up to date, as the detail expands and evolves;
- Ensuring that the research case and organisational implications of day-to-day evolution of the solution are properly modelled and thought through;
- Ensuring the impact of organisational decisions (internal and external) is reviewed in the context of the project;
- Ensuring the research and technical components of the solution collectively provide a cohesive whole at project level and at organisational level;
- Ensuring the non-functional requirements are achievable and subsequently met;
- Taking responsibility for tracking requirements through to acceptance by principal project stakeholders;
- Liaising with the principal contact in organising support for the solution through implementation into live use.

Team Leader

- Facilitating the team focus on the on-time delivery of agreed products;
- Encouraging full participation of team members within their defined roles, responsibilities and empowerment;
- Ensuring that the iterative development process is properly focused and controlled;
- Ensuring that all testing and review activity is properly scheduled and carried out;
- Managing risks and issues at the timebox level, escalating to the Project Manager, principal team contact or technical coordinator as required;
- Monitoring progress on a day-to-day basis for all team activities;
- Facilitating communication of team progress with the Project Manager;
- Facilitating the daily stand-ups, ensuring they are timely, focussed and brief;

- Facilitating reviews and retrospectives with the team.

Developer

- Working with all other team members to iteratively develop:
 - The research projects;
 - Models required for the properly controlled development of the research projects;
 - Models and documents as required for the purpose of supporting the research project in live use.
- Testing the output of their own work prior to independent testing;
- Agreeing and adhering to technical constraints;
- Adhering to the organisation's technical implementation standards and best practice;
- Participating in any quality assurance work required to ensure the delivered products are truly fit for purpose;
- Recording (and later interpreting) the detail of any
 - Changes to the detailed requirements;
 - Changes to the interpretation of requirements which result in re-work within the solution;
 - Information likely to impact on the ongoing evolution of the solution.

Tester

- Working with project partners and Research Analysts to define test scenarios and test cases for the research projects;
- Carrying out all types of technical testing of the research project as a whole;
- Liaising with the Research Analyst and project partners to help clarify acceptance criteria for requirements;
- Creating test products as appropriate, e.g. test cases, test plans and test logs;
- Reporting the results of testing activities to the Technical Coordinator for quality assurance purposes;
- Assisting the project partners so that they can plan and carry out their tests well enough to ensure that the important areas are covered.

Technical Advisor

- Requirements, design and review sessions;
- The operational perspective for day-to-day decisions;
- Operational or support scenarios to help define and test the solution;
- Assurance that the solution is evolving correctly;
- Operational acceptance testing;
- Development of technical support documentation;
- Training of technical operations and support staff;
- Incremental deployment of the solution releases, as appropriate.

Appendix B: SFIA Definitions

Skills Framework for the Information Age (SFIA) has the flexibility to accommodate research and teaching-intensive roles. Mature RSE teams will be conversant with a range of different industry standards and frameworks and open to aligning to them but a principle of loose-coupling, anchored by SFIA, will be appropriate for many. See <https://sfia-online.org> for detailed information about Levels of Responsibility & Professional Skills.

Levels of Responsibility

Levels of responsibility refer to the levels of responsibility and accountability. The underlying structure of SFIA ensures that the definitions of professional skills are defined in a way that makes their different levels recognizably distinct. This makes them useful as generic definitions, suitable for use as the basis of core competencies. Teams that already have a set of core competencies can use SFIA Levels of Responsibility in combination with SFIA's professional skills (see below). The organisation will still benefit from the sensible spacing of levels that the framework provides.

There are 7 Levels of Responsibility, described in 4 ways:

- **Autonomy:** The amount of control the staff-member has over their work.
- **Influence:** The amount of influence the staff-member has in their organization and/or team.
- **Complexity:** The degree of organizational and/or technical complexity the staff-member has responsibility for.
- **Business Skills:** The amount of initiative, planning, and problem-solving skills the staff-member requires to perform their job.

Skills

The skills in SFIA are grouped into categories and subcategories for the convenience of users, each with a different code. It is not proposed that these equate to jobs or areas of personal responsibility. The grouping is intended to assist people who are incorporating SFIA skills in role profiles or job descriptions, or who are building an organisation's IT competency framework. 46 of the 97 SFIA skills listed below are used by King's RS staff.

Analytics	Digital marketing	Network support	Service acceptance
Animation development	Emerging technology monitoring	Organisation design and implementation	Service level management
Application support	Enterprise and business architecture	Penetration testing	Solution architecture
Asset management	Facilities management	Performance management	Sourcing
Availability management	Financial management	Portfolio management	Storage management

Benefits management	Hardware design	Portfolio, programme and project support	Sustainability assessment
Business analysis	Incident management	Porting/software configuration	Sustainability engineering
Business modelling	Information assurance	Problem management	Sustainability management
Business process improvement	Information content authoring	Product management	Sustainability strategy
Business process testing	Information content publishing	Professional development	System software
Business risk management	Information management	Programme management	Systems design
Capacity management	Information security	Programming/software development	Systems development management
Change implementation planning and management	Information systems coordination	Project management	Systems installation/decommissioning
Change management	Innovation	Quality assurance	Systems integration
Configuration management	IT governance	Quality management	Teaching and subject formation
Conformance review	IT Infrastructure	Quality standards	Technical specialism
Consultancy	IT management	Relationship management	Testing
Continuity management	IT strategy and planning	Release and deployment	User experience analysis
Contract management	Learning and development management	Requirements definition and management	User experience design
Customer service support	Learning assessment and evaluation	Research	User experience evaluation
Data analysis	Learning delivery	Resourcing	
Data management	Learning design and development	Security administration	