

<b>Cover Sheet for Proposals</b> <i>(All sections must be completed)</i>		
<b>Name of Capital Initiative:</b>	Enterprise Architecture Group Pilot Call	
<b>Name of Lead Institution:</b>	Cardiff University	
<b>Name of Proposed Project:</b>	Lean Enterprise Architecture	
<b>Name(s) of Project Partner(s):</b>	N/A	
<b>Full Contact Details for Primary Contact:</b>		
<b>Name:</b>	Paul Hobson	
<b>Position:</b>	Associate Director – Information Services	
<b>Email:</b>	hobsonpd@cardiff.ac.uk	
<b>Address:</b>	Information Services, Cardiff University, 40-41 Park Place, Cardiff, CF10 3BB	
<b>Tel:</b>	029 20874490	
<b>Fax:</b>	029 20874285	
<b>Length of Project:</b>	1 year	
<b>Project Start Date:</b>	End January 2008	<b>Project End Date:</b> End January 2009
<b>Total Funding Requested from JISC:</b>	£50,000 plus allowable extras (see project budget)	
<b>Funding Broken Down over Financial Years (Apr–Mar):</b>		
<b>Apr07 – Mar08</b>	<b>Apr08 – Mar09</b>	
£8,333	£41,667	
<b>Total Institutional Contributions:</b>	£81,383	
<b>Outline Project Description</b>		
<p>The project will apply a number of methodologies for process improvement, including TOGAF, Lean Thinking, and Soft Systems Methodology, document their impact on defining a Service Oriented Architecture and provide a report and other information on the Enterprise Architecture initiative at Cardiff University. The project will use tools and governance provided by Cardiff's MWE Programme and will examine the cultural issues relating to its implementation in a Higher Education environment.</p>		
<b>I have looked at the example FOI form at Appendix A and included an FOI form in the attached bid (Tick Box)</b>	<b>YES</b> ✓	<b>NO</b>
<b>I have read the Circular and associated Terms and Conditions of Grant at Appendix B (Tick Box)</b>	<b>YES</b> ✓	<b>NO</b>

## FOI Withheld Information Form

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We would like JISC to consider withholding the following sections or paragraphs from disclosure, should the contents of this proposal be requested under the Freedom of Information Act, or if we are successful in our bid for funding and our project proposal is made available on The JISC website. We acknowledge that the FOI Withheld Information Form is of indicative value only and that JISC may nevertheless be obliged to disclose this information in accordance with the requirements of the Act. We acknowledge that the final decision on disclosure rests with JISC.

Section / Paragraph No.	Relevant exemption from disclosure under FOI	Justification
Section 6.0 – Paragraph 6.01 Budget	Section 40 – Personal Information	Contains information that would allow details of personnel salaries to be inferred.

## Supporting Letter

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JISC  
Northavon House  
Coldharbour Lane  
Bristol  
BS16 1QD

2<sup>nd</sup> October 2007

To whom it may concern,

**Re: JISC Circular 02/07: Appendix D – JISC Capital Programme  
Enterprise Architecture Group Pilot Call**

Please find attached a project proposal which on the behalf of Cardiff University, I am delighted to support. The “Lean Enterprise Architecture” Project requests grant funding from the JISC Capital Programme ‘Enterprise Architecture Group Pilot Call’, and will commit University resources identified in the budget outline. I believe the award of this grant would be of significant benefit to both the wider HE community and the University.

The project brings together a number of strands of work where we can already demonstrate leadership and innovation, including the recent establishment of the Lean University Project to apply lean thinking in a University context and our major Modern IT Working Environment Programme, which includes a range of IBM software tools for business process automation, data management practices and application integration using a Service Oriented Architecture. A case study of our innovative work in this area will be informative to institutions in the HE environment which are examining the feasibility of Enterprise Architectures and will also seek to inform the good practice and process models that are being developed within the JISC e-Framework Programme.

The project’s focus on Enterprise Architecture and process improvement is directly aligned with the University’s strategy and is also a key thread of the supporting Information Services strategy. An important aim is to develop effective, efficient and empowering processes which serve the core business of education, research and ‘knowledge transfer’ well.

From the Cardiff University Strategic Plan 2006/2007 to 2010/2011:

- Improving decision making through better integration of processes, management information systems and all planning and policy issues;
- Initiating the Lean University Project which will develop and embed lean thinking across the University to improve the efficiency and effectiveness of management practices and will release resource to achieve strategic aims.

From the Information Services Strategy 2006 – 2011:

- As part of the Modern Working Environment, the main thrust of this group of projects will develop lean IT-enabled business processes University-wide that integrate the existing standalone applications into the new environment.

We are delighted to take up this opportunity to continue our work with JISC, building on our strong track record and sharing our experience of adopting a service oriented approach.

Yours Faithfully,

M C Harrow

**Director of Information Services**

## 1.0 Introduction

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- 1.01 This proposal is a request for funding against the JISC Capital Programme Call for Projects Circular 02/07. The project will apply a number of methodologies for process improvement, document their impact on defining a Service Oriented Architecture and provide a report and other information on the Enterprise Architecture initiative at Cardiff University. The project will use tools and governance provided by Cardiff's MWE Programme and will examine the cultural issues relating to its implementation in a Higher Education environment.
- 1.02 The core objectives of the project are:
- To identify a set of existing core University business processes requiring improvement
  - To apply Systems Thinking / SSM, TOGAF and LEAN methodologies to developing/improving a selected existing process. Application of SSM will provide the Business->Information link and feed into TOGAF. LEAN methods may be able to optimise the resultant processes
  - To Document the Business->Information->Application->Technology decision process
  - To Implement the process using appropriate methods and tools
  - To collect metrics and model an existing process
  - To design process improvements and include metrics for measuring performance
- 1.03 We are seeking JISC funding of £50,000 which will represent less than 40% of the overall project costs.

## 2.0 Institutional Readiness

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- 2.01 The University's strategy is published at <http://www.cardiff.ac.uk/plann/strategicplan/index.html>

There are four main aspects to the strategy:

1. Research
    - It is Cardiff University's vision to be a world-leading University, and the University aims to pursue research that is recognised as internationally distinguished in its quality and impact.
  2. Learning, Teaching and Assessment
    - To pursue learning and teaching together with professional training and development that are recognised as internationally distinguished in their quality and impact.
  3. Innovation and Engagement
    - To make a significant and sustainable contribution to health, economy, education and culture through the application of our strengths for the needs and good of societies throughout the world.
  4. Widening Access and Retention
    - To develop long-term, sustainable widening access practices, which span the whole University and which are embedded into the University's strategic thinking, to remove real and perceived barriers to Higher Education, and to encourage and enable participation by all who are able to benefit from it.
- 2.02 Achievement of these ambitions will depend on investment and success in the key areas that enable achievement of the core strategic aims; namely people, financial resources, infrastructure and working practices. It will also depend on maintaining excellence in both current and future activities.

## Information Services

- 2.03 The Information Services (INSRV) strategy is totally aligned with the University's Aims and Strategic Plan and is focused through three Strategic Action Areas: Excellence Today; Creating New Futures and Changing INSRV. The INSRV Strategy is published at:

<http://www.cardiff.ac.uk/insrv/aboutus/strategy/index.html>

- 2.04 Support for process improvement and redesign is given from the highest level of the University down. The MWE Governance has already undertaken a first pass requirements analysis and prioritisation from stakeholder input. This analysis has identified a number of processes which will have been prioritised and commented upon by the three main sub-groups within the programme.. The documented outputs from this process could be provided under NDA.

## Cardiff's Modern IT Working Environment Programme (MWE)

- 2.05 Cardiff has made a substantial and well publicised commitment to implement a Service Oriented Architecture (SOA) in support of the MWE initiative. This project will be run within that initiative and will help to drive establishment of the SOA thereby demonstrating how SOA can be created and deliver benefits in one of the UK's largest Universities.
- 2.06 INSRV are already providing an SOA approach under one of the keystone services it delivers, namely the IDMan Project which uses an opensource enterprise service bus product and has has defined a number of services.
- 2.07 The MWE Programme has identified the need for High level Architectures and we are close to completing the appointment of staff to the positions of both SOA Architect and Data Architect alongside our existing portfolio of IT specialists.
- 2.08 The project is part of existing Cardiff MWE strategy designed to solve an institution-wide problem with a high degree of innovation in domains of technology and process efficiency. It will exploit EA building on extensive experience of the project team and utilizing technologies that implement open standards. It will share the experience gained with the HE community thus providing a source of knowledge, experience and good practice.
- 2.09 The MWE is an ambitious programme to deliver a new and comprehensive IT environment for everyone in Cardiff University. The MWE infrastructure is being developed to help the University to achieve:
1. Collaborative research of international standing
  2. Learning and Teaching excellence
  3. A modern and distinctive Student Experience
  4. Lean administration with high quality dynamic management information
- 2.10 The MWE will support and empower all researchers, lecturers, students and administrators by giving them the modern information tools, resources and services they need to achieve their personal goals. To date most of the work undertaken on this project is to provide an infrastructure to support MWE including security and single sign-on, a Portal framework and collaboration tools. The LEA project will look at SOA principles to deliver an integration solution and inform role-based personalization within the MWE.
- 2.11 The central role of SOA in this solution is sure to be of interest to JISC and the wider HE community. The high expectations for SOA require a genuine proof of their value for HE in order to help other institutions complete strategic planning to adopt and exploit SOA. In this project we will demonstrate how technology, harnessed in a SOA, better supports the management strategy of the institution. We will identify and share lessons learnt in making this transition through providing the opportunity to improve business processes relevant to the day to day operation of the University, by acting as an "enabler" for leaner and more flexible process design.

## Cardiff's LEAN University Project

- 2.12 The Lean University Project aims to develop and embed lean thinking across the University to improve the efficiency and effectiveness of management practices, improve value to external and internal customers and release resource to achieve strategic aims. The benefits of such an approach are to reduce internal waste (for example reducing dependence on legacy processes that are not well integrated) and improve customer value (for example by freeing up staff time by streamlining inefficient administration processes).
- 2.13 The project is being led by the Lean Enterprise Research Centre (LERC), based in Cardiff Business School and is being delivered under the University's Project Management Framework.

### **ITIL and the ITSM Project at Cardiff**

- 2.14 The ITSM Project will implement a new service desk, configuration database and change management processes conforming to ITIL and delivered through the InfraEnterprise product. During the selection process for this product, Cardiff University have initiated working contact with TU Delft in the Netherlands as a reference and mentor site for the product. In addition, Cardiff expects to implement an automated agent based system for gathering inventory details on all systems connected to the Cardiff campus networks. This is expected to provide the necessary data supporting the technical aspects of an Enterprise Architecture, without the manual data entry overheads identified in a previous EA project.

### **IT Standards at Cardiff University**

- 2.15 Dr Hugh Beedie, Chief Technology Officer for INSRV, first proposed and organised the IT Standards Group that Paul Hobson now chairs. This has been setup in order to reduce the number of different methods in use, document the preferred standards and promote their application in all new IT Services.

## **3.0 Evidence of Senior Staff**

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- 3.01 Paul Hobson has worked in Information Services at Cardiff University for the past 3 years. He has 12 years of experience in Research, Public Sector and Commercial Sector IT operations and development. Prior to working at Cardiff, Mr Hobson was responsible for West Devon Borough Council's ICT development for the Office of the Deputy Prime Minister's 'Implementing E-Government Programme'. Under this Programme, he delivered a strategic review of the Council's existing Systems and Information Architecture and assisted in driving forward a challenging change programme to implement leaner service-based processes to the Borough.
- 3.02 He holds positions on the main MWE Programme Governance Group leads the Information Services' input to the Research Portal Services Implementation Group, and has been involved in MWE programme since its inception. Further details of Mr Hobson's experience may be found in the attached Curriculum Vitae (Appendix A).
- 3.03 Dr Beedie has been working in Cardiff University's IT Services for more than 25 years in a variety of technology-related roles and has sponsored previous JISC projects on behalf of the University including:
- 3.04 "The Identity Project" (Cardiff University in collaboration with the London School of Economics): currently investigating Identity Management (IDM) across the UK academic environment, looking at intra, and inter, institutional requirements of IDM. The Identity Management system already implemented at Cardiff will underpin further work in role-based personalisation and seamless integration.
- 3.05 "ASMIMA" (Cardiff University): Shibboleth early-adopter program giving Cardiff extensive experience with Federated Access Management which may be a useful adjunct to the inter-institutional aspects of the work proposed.
- 3.06 As noted previously, this project is core to Cardiff's institutional strategy and runs within the

multi-million pound MWE programme. It additionally supports national strategy for the Welsh Assembly and so will be of de facto interest to other Welsh HE and FE institutions.

- 3.07 In 2005 Dr Beedie sponsored and led a pilot project to explore the use of EA modelling techniques for Cardiff University. This involved piloting the use of the EA WebModeler<sup>1</sup> product and looked at modelling all aspects of an Enterprise Architecture within one package. This work was set aside with the advent of the MWE Programme with a view to recommencing the initiative once appropriate governance structures were in place.
- 3.08 At the time, one finding from this work was the difficulty in demonstrating value in modelling all 4 major strands of an Enterprise Architecture within one EA application.
- 3.09 Steve McIntosh has been closely involved in the justification of the adoption of SOA across military logistics applications as part of a joint MoD/Industry team. In the course of this work, Mr McIntosh has produced various models meeting the requirements of different strategic and operational views required by “MoDAF”, the UK MoD’s implementation of TOGAF. He is also advisor to the logistics IT staff on the application of a target architectural framework and the interpretation of architectural standards to achieve interoperability of applications across Defence logistics.
- 3.10 Jeremy Hilton has worked as a consultant for the UK Post Office Research Group developing their Security Architecture. His work was contributed by the Post Office to The Open Group as an input to what has become TOGAF. He has been involved with x/Open and now The Open Group since 1992 and co-chaired the Security RTG for a number of years, partly funded by the Ministry of Defence. At the time he was working on the Post Office Security Architecture, he was also advising the MOD on the security aspects of their architecture framework, as they were adapting the US DoDAF for MoD use.
- 3.11 He is currently working for a large Government department in the West Country in two areas; developing their Information Assurance Capability Needs Roadmap (within this, he will be developing a security architecture view of the pan-Government Enterprise Architecture) and has developed their business architecture which has become their blueprint for change. He also leads a small Cardiff team advising/mentoring their Strategic Development Team which supports the business in change activities.

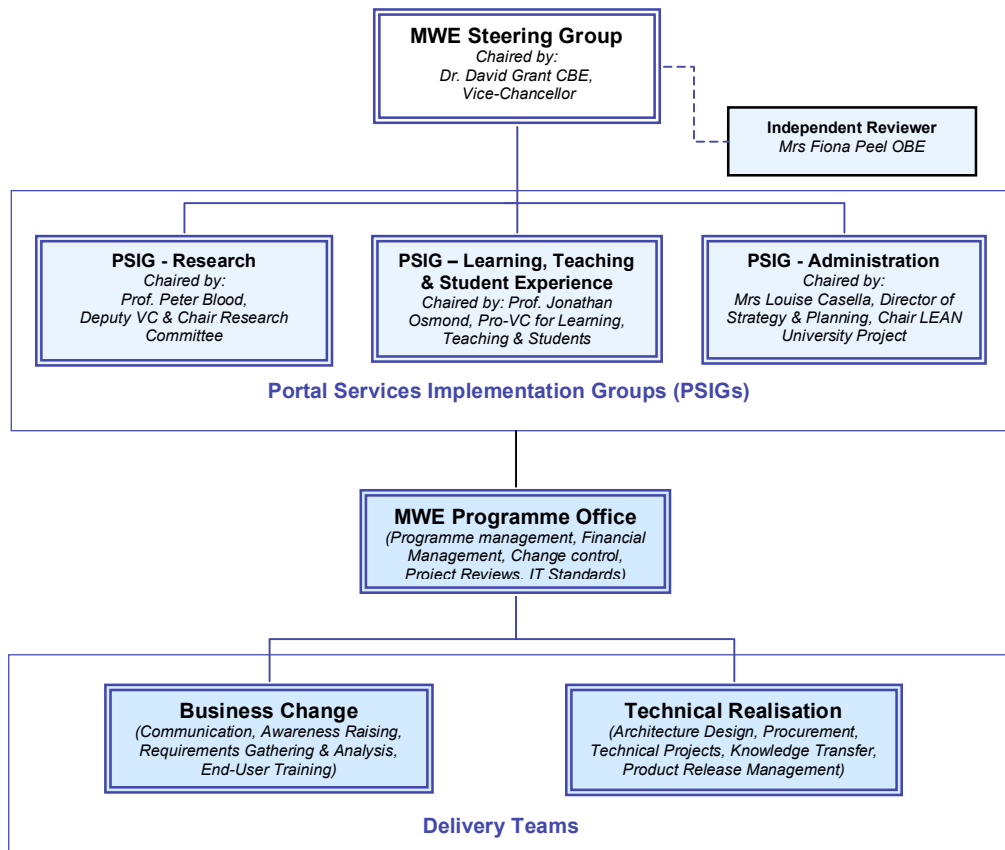
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<sup>1</sup> [http://www.agilense.com/p\\_overview.html](http://www.agilense.com/p_overview.html)

## 4.0 Institutional Commitment

### Project Structure

#### 4.01 MWE Structure and Governance



4.02 The EA project will be run within the MWE programme under the university's project management methodology. The MWE has a steering group chaired by the Vice Chancellor and is sponsored by Martyn Harrow, the Director of Information Services.

4.03 The 3 Portal Services Implementation Groups (PSIGs) are chaired by other Senior University staff. This structure reflects focus on the 3 major communities implicit in the University strategy. The main involvement for this project will be the Admin PSIG.

4.04 All project activities will be directed by a project steering group made up of key decision makers. The INSRV Board sponsor for the project is Dr. Hugh Beedie, who holds overall responsibility for the success of the project in all respects, both to Cardiff as well as JISC.

### Project Team

#### 4.05

Name	Job Title	Project Role(s)	% FTE	Days
Paul Hobson	Associate Director – Deputy CTO	Project Manager and main contributor	50%	110
Hugh Beedie	Assistant Director -Chief	Steering Group and	10%	22

Ann Saalbach	Technology Officer Associate Director – Head of Business Information Systems	technology design Steering Group and Service Owner. Link to Admin PSIG.	5%	11
Jeremy Hilton	Lecturer in School of Computer Science	Steering Group and Requirements Analysis Advisor	5%	11
Steve McIntosh	Director in School of Computer Science	Steering Group and Requirements Analysis Advisor	5%	11
Joe Nicholls	MWE User Requirements Consultant	Role and Activity analysis	10%	22
Rhys Smith	Engineering Consultant	Identity & Access Management	5%	11
David Harrison	Assistant Director – User Enablement, Chair UCISA	Steering Group and UCISA stakeholder	2%	4
Lucy Burrow	University Records Manager	Steering Group and Corporate Compliance	2%	4
TBD	SOA Architect	Design overview of Services from SSM/TOGAF methodologies	30%	66
TBD	Data Architect	Implementation of defined Services using MWE tools	30%	66

### Contribution to Project in Addition to Staff Time

- 4.06 We will be implementing the pilot IT process improvement aspects of the project on a High Availability virtualised server environment and implementing production services on the main production MWE environment. We estimate this contribution to be approximately £25,000 in software and hardware as outlined in the project budget.

### Project Timetable and Phase Deliverables

4.07

Task	Start	End	Deliverables
<b>SSM workshop</b>	Nov 07	Nov 07	
<b>Presentation to MWE Governance</b>	Jan 08	Jan 08	
<b>Project initiation documents including project plan</b>	Feb 08	Feb 08	Detailed Project Plan
<b>Website launch</b>	Feb 08	Feb 08	Collaboration Website
<b>Presentation to MWE Governance</b>	Feb 08	Feb 08	
<b>TOGAF training completion</b>	Mar 08	Mar 08	
<b>List of processes</b>	Mar 08	Mar 08	
<b>Selection from list of processes</b>	Apr 08	Apr 08	
<b>Quarterly Progress Report</b>	Apr 08	Apr 08	Progress Report
<b>TOGAF analysis</b>	Mar 08	Jun 08	
<b>SSM analysis</b>	Mar 08	Jun 08	
<b>LEAN analysis</b>	Mar 08	Jun 08	
<b>SOA definition</b>	Jul 08	Jul 08	
<b>Interim Progress Report</b>	Jul 08	Jul 08	Progress Report
<b>Data design</b>	Aug 08	Aug 08	

<b>Pilot implementation and UAT</b>	Sep 08	Oct 08	
<b>Quarterly Progress Report</b>	Oct 08	Oct 08	Progress Report
<b>Draft final report</b>	Dec 08	Dec 08	Draft Final Report
<b>Final Project report and closedown</b>	Jan 09	Jan 09	Final Project Report – Longitudinal Case Study

## 5.0 Risk Assessment

5.01

<b>Risk</b>	<b>Probability</b>	<b>Impact</b>	<b>Amelioration</b>
<b>Staffing: Failure to recruit Data Architect</b>	Low Probability	Medium Impact	Accept potentially lower quality process implementation in the short term
<b>Staffing: Failure to recruit SOA Architect</b>	Low Probability	Medium Impact	Re-allocate documentation tasks across the project group.
<b>Staffing: Loss of Project Manager</b>	Low Probability	High Impact	Change task priorities of SOA and Data Architects.
<b>Staffing: Unavailability of key COMSC partners</b>	Low Probability	Medium Impact	Reassign additional requirements management support from Information Services resource
<b>Failure to produce deliverables due to unexpected complexity</b>	Low Probability	High Impact	Steering group to maintain control of milestones and deliverables. Reduce potential deliverables. Use MWE Governance to address.
<b>Failure to produce deliverables due to lack of internal cooperation</b>	Medium Probability	High Impact	More effort applied to internal marketing. Utilise MWE Governance to allocate additional effort.
<b>Unable to identify sufficient core business processes</b>	Low Probability	High Impact	Allow more time for process identification. Use core MWE Governance to elevate the priority
<b>Too many core business processes identified</b>	Low Probability	Low Impact	Require input of MWE Governance to provide priority
<b>Incompatible methodologies</b>	Low Probability	Medium Impact	More time required for resolution of differences.
<b>Process proves too difficult to implement with chosen methods</b>	Low Probability	Medium Impact	Choose a different method and delay the University implemented process improvement.
<b>Lack of user engagement with improved process</b>	Medium Probability	High Impact	Learn lessons of failure and document reasons for lack of engagement. Report to MWE Governance to mitigate repeating failure.

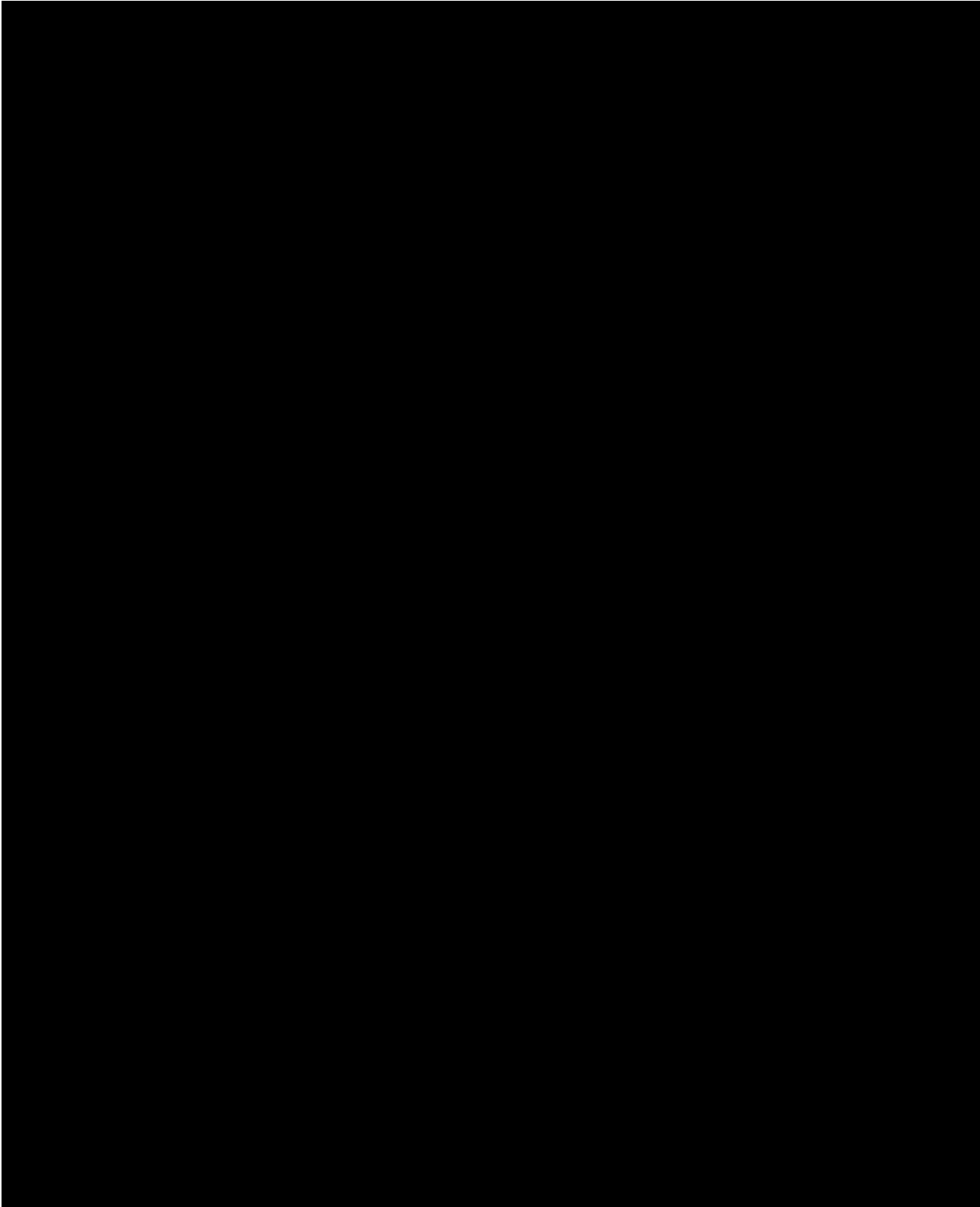
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<b>Difficulty in obtaining accurate costs and measurable benefits</b>	Medium Probability	Low Impact	Failure of the University's EA initiative would be documented in the project report as a firm outcome.
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## 6.0 Budget

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## Benefits

- 6.02 Benefits for Cardiff
  - Wider community engagement with those attempting this kind of approach
  - Additional training opportunities above those available at Cardiff University
  - Access to trained Enterprise Architects
  
- 6.03 Benefits for Cardiff and Wider Community
  - Evaluation of different process improvement methodologies
  - Sharing the experience of gaining senior management buy-in
  - Introduction of LEAN methodology in UK HE environment
  - Wider output of information and lessons learned from implementing an Enterprise Architecture to facilitate business level changes

## Dissemination Activities

- 6.04 We will establish a project website at initiation of the project. Deliverables, such as progress reports will be posted to the website on a regular basis and will be openly accessible. A printed copy of the final report will be distributed to key stakeholders in the project, and will be available through the project website.
  
- 6.05 Dissemination activities will also be integrated with our new MWE collaboration tools. A blog will be created at project initiation to regularly update interested parties on project progress and a project wiki will promote discussion and encourage open communication between the project team and other stakeholders.
  
- 6.06 Members of our project team will also be available should they be required to participate in related conferences, workshops or other events organised by JISC and we are willing to assist with any other relevant JISC communication programmes.

## Appendix A – Detailed Curriculum Vitae

### Curriculum Vitae: Paul D Hobson

#### Profile

Paul is an experienced and innovative senior manager with a track record of successful deliveries in IT Operations and Development across the breadth of industry sectors. He is a strong leader and exceptional strategist and has experience of leading diverse teams of up to 15 developers through the full software lifecycle. He is directly responsible as a design authority for Cardiff University's Modern Working Environment Programme, specifically around its Architecture.

#### Experience

##### **Associate Director - Web Service Delivery and Research Support, Cardiff University, 2005-present**

Paul is responsible for managing the full SDLC (software development lifecycle) of the directorate's web initiatives and setting the strategy for group's development. The technology platform is typically Oracle 10g and J2EE running on a RedHat/TomCat/Apache stack. Recent projects have included the delivery of a commercial Content Management System (CMS) serving the University's corporate web presence, an web-delivered Issues Management system, and the specification and procurement of open standard technologies for the Modern Working Environment (MWE) Programme.

Managing both internal developers and a third party software house Paul has successfully delivered complex projects using agile development practices and matrix-management of staff from different functional and operational teams.

##### **ICT Development Manager, West Devon Borough Council, 2004-2005**

As Development Manager, Paul held primary responsibility for all geospatial information systems, data integrity and systems development – including implementation of Ordnance Survey Mastermap data (GML2 compliant) utilising a spatial RDBMS (Oracle 9i). He led improvements to the Authority's data accuracy by being responsible for data accuracy change management due to Ordnance Survey Positional Accuracy Improvement Programme.

Other developments included:

- Introduction of strict data management policy and processes as a move towards a more formalized Architecture.
- Implementation of key corporate systems in support of key E-Government targets set by the Office of the Deputy Prime Minister.
- Procurement and implementation of a corporate Document Management System using PRINCE2 Project Management.
- Development of Web Services for integrating spatial data systems with Web-delivered Mapping and Case Management CRM.

### **IT Implementation Officer, University of Exeter, Exeter, 2004**

Paul assisted in the implementation of the student records system across the University, working with the Schools and central administration, leading the Admissions component of the project.

He analysed and improved the Schools' business processes and academic framework in the context of central processes and academic policies and provided support to users through documenting processes and producing training materials. Additionally, he evaluated the use of the student timetabling process with the current Timetabling Officer and play a key role in the implementation of the solution across Academic schools.

### **Senior Operations Consultant, 2002-2004**

Paul worked with a number of clients during this period, including: BBC, ActionAid, Spiritsoft and NASDAQ Europe. He covered operational support for most UNIX and all Windows platforms, with additional specialist support for leading RDBMSs, data integration and virtualization solutions. He designed and delivered a multi-platform development and test environment for Spiritsoft to enable the development and testing of their market leading Java Messaging Service products.

He was responsible to Head of Operations for 1st line support (24/7) of live NASDAQ Europe exchange environment using custom Perl/ksh scripting and Tibco Hawk monitoring and supported the NASDAQ development team in bug tracking and change/release management of new software releases. He held joint responsibility in the operations team for the Exchange web environment in both test and production as well as for customer JMS messaging gateways.

At ActionAid he audited and reviewed the IT Architecture supporting the charity's main business systems and concluded that a six figure annual saving could be delivered through rationalization and migration from HP-UX to Linux. Paul successfully delivered this migration on time and to budget.

For the BBC, Paul provided operational cover of the Audience Data Services for both TV and Radio, renewing the service by upgrading the infrastructure and operating system to Solaris 9 on Sparc infrastructure.

### **Web Editor, Swansea University, 2001-2002**

Paul provided an objective analysis of the legacy site, reporting of findings to University Senior Management and successfully gained backing for the redesign of the University's web presence. He introduced a web content management system to remove publishing bottleneck of using technical authors, redesigning the core infrastructure and Information Architecture.

### **Senior Research Assistant, Swansea University, 1995-2001**

Paul was responsible for the project management of a Natural Environment Research Council Grant of £250K and team management of associated research students. He organized and executed the running of extensive fieldwork campaigns in the UK and contributed to large scale campaigns overseas – successfully bidding to become a contributor to the NASA MODLAND validation network (<http://landval.gsfc.nasa.gov/MODIS/coresite.php?SiteID=6>)

Paul specified, procured and installed a high-performance Linux cluster, dual purposing the

setup to provide individual workstations and a partial Beowulf cluster. Responsible for complete network and system administration of this cluster, he successfully extended the value of the setup by implementing an mpich-based solution for the parallel processing of satellite image data.

**Education**

University of Manchester, 1995, B.Sc. (Hons) Geography (2:1)

**Professional Memberships**

Institute of Electrical and Electronics Engineers  
Association of Computing Machinery