Sherwood Forest Hospitals NHS
NHS Foundation Trust

Sherwood Forest Hospitals NHS Foundation Trust

Picture Archiving And Communication System (PACS) Replacement

Full Business Case (FBC)

Version 1.2

Glossary Of Terms:

Abbreviation	Meaning
Access Agreement	Terms under which any NHS Body may access the Services defined in the Wave 2 contract.
Bidder	A single operating organisation/person that has been short-listed through the PQQ, ITPD, ISDS evaluation process and invited to participate in the ISFT stage and which is bidding for the Replacement PACS.
BSI	British Standards Institute
DH	Department of Health
EMRAD	East Midlands Radiology Procurement Consortium comprising: • Chesterfield Royal Hospital NHS Foundation Trust (CRH) • Kettering General Hospital NHS Foundation Trust (KGH) • Northampton General Hospital NHS Trust (NGH) • Nottingham University Hospitals NHS Trust (NUH) • Sherwood Forest Hospitals NHS Foundation Trust (SFH) • United Lincolnshire Hospitals NHS Trust (ULH) • University Hospitals of Leicester (UHL)
FBC	Full Business Case
Final Tender	A Bidder submission in response to the ISFT which is a Compliant Final Tender
Financial Schedule	A Schedule which is part of ISFT Volume 2 which needs completing and submitting as part of a Bidders response.
HSCIC	Health and Social Care Information Centre
ICT	Information, Communications and Technology
IG	Information Governance
ISDS	Invitation to Submit Detailed Solutions sent to Bidders that are successful at ITPD stage.
ITPD	Invitation to Participate in Dialogue sent to Bidders that are successful at Pre-Qualification stage
Members Agreement	A framework of detailed rules governing the management of the Programme; establishes the necessary management infrastructure; sets out the roles and responsibilities of the various bodies involved in the Programme; establishes in detail the mechanism by which the costs of the Programme will be calculated and divided between the Members.
NHS	National Health Service
NTDA	NHS Trust Development Authority

Abbreviation	Meaning
OBC	Outline Business Case
OJEU	Official Journal of the European Union
PACS	Picture Archiving And Communication System
PIN	Prior Information Notice
POD	Project Overview Document
PQQ	Pre-Qualification Questionnaire
Pre-Qualification	The process by which Bidders are selected following the submission of responses to the PQQ
RCR	Royal College of Radiologists
RIS	Radiology Information System
Services	The services being procured by Sherwood Forest Hospitals NHS Foundation Trust to be delivered through the Sherwood Forest Hospitals NHS Foundation Trust Scheme and which are detailed in draft in the ISFT
TUPE	Transfer of Undertakings (Protection of Employment) Regulations 2006 (SI/2006/246)
Wave 1 Contract	A proposed form of contract to be entered into between Sherwood Forest Hospitals NHS Foundation Trust and the Supplier for the provision of the Products / Services.
Wave 2 Contract	A proposed form of contract to be entered into between another NHS Body for the provision of the Products / Services specified subject to an Access Agreement with Nottingham University Hospitals NHS Trust

Table Of Contents:

Table Of Figures

1 Executive Summary

1.1 Introduction

This document comprises a Full Business Case for Sherwood Forest Hospitals NHS Foundation Trust (SFHFT/the Trust) signing contracts with a supplier to deliver a new Picture Archiving and Communication System (PACS) and accompanying Radiology Information System (RIS). It will replace the Trust's existing PACS/RIS service provided by Accenture both to this Trust and many others in the area. It is needed because the Trust's current contract with Accenture expires in March 2015 and is only capable of being extended at premium prices on a month by month basis for a further 12 months.

The Outline Business Case (OBC) identified the preferred way forward as being to procure a new solution collaboratively along with other local Trusts in the East Midlands Radiology (EMRAD) procurement consortium using the Official Journal of the European Union (OJEU) Competitive Dialogue procedure. It also confirmed that the new solution should be hosted externally and should have a flexible configuration with the ability to share images and reports with other healthcare organisations so as to maximise the benefits and opportunities associated with this technology.

Since the OBC was approved the Trust and its partners in the EMRAD consortium have been undertaking the procurement. It has reached the point where a preferred bidder has been identified. Approval of this FBC will allow the Trust to sign a contract with the bidder, after which work can start on transitioning to the new PACS/RIS service. Other Consortium Trusts will follow their own business case approvals process in order to sign their own contracts with the preferred bidder.

In line with the 5-case approach to NHS ICT business cases, the FBC is structured as follows:

- The Strategic Case section – explains why the investment is needed and the nature of the investment objectives.
- The Economic Case section – confirms the value for money of the solution based on the specific costs, benefits and risks of the preferred bidder.
- The Commercial Case section – explains commercial aspects of the solution.
- The Financial Case section – demonstrates how the investment will be afforded.
- The Management Case section - demonstrates that the scheme is achievable and can be successfully delivered in accordance with accepted best practice.

First, a brief summary of the contents of the business case is now provided.

1.2 Executive Summary

1.2.1 What Is The Nature Of The Proposed Investment?

The investment recommended by this Full Business Case comprises the deployment and operation of a new PACS and RIS service that will replace the existing Accenture PACS/RIS service. PACS is the term used to describe an IT system used in conjunction with a RIS to schedule, acquire, store, retrieve, report on and share digital X-rays and other types of digital images within an organisation and across a wider clinical network. PACS/RIS has been used extensively across the East Midlands in recent years to radically improve the delivery of patient care by providing rapid access to appropriate clinical images from the point of care in multiple settings. PACS is a well-established part of the essential fabric of health care delivery across the UK.

1.2.2 Why Is It Needed?

SFHFT, along with the majority of Trusts in the East Midlands area, currently receives a PACS/RIS service under a contract with the Local Service Provider (LSP) Accenture. Under the terms of the existing contract the Trust has given notice to the LSP that it will exit the PACS/RIS contract with Accenture and at the end of February 2015 will enter into an exit transition phase that allows the Trust to extend the contract on a month by month basis until a replacement PACS/RIS is operational. The extension period, however, finally expires in June 2016 and hence given the criticality of PACS/RIS to the operation of the Trust a new service must be operational before that date.

1.2.3 What Is The Scope Of This FBC?

A working PACS/RIS service comprises a 'core' PACS and RIS plus connected components including specialist reporting workstations and image acquisition modalities such as Computerised Radiology (CR). These are currently all provided by Accenture under the current LSP contract, and on termination of the LSP contract ownership of the workstations and CR modalities will transfer to the Trust. They will thereafter need day to day operational support and will also need to be refreshed over time as they reach the end of their lives.

The scope of this FBC regarding approval of both funding and contract signature of these elements is summarised below.

Item	Funding Approval Requested Via This FBC?	Contract Signature Approval Requested Via This FBC?
Core PACS & RIS supply and support	Yes, based on costs of preferred supplier to emerge from procurement	Yes, based on outcomes of the core PACS & RIS procurement
Supply and support of specialist PACS & RIS products, such as for cardiology, radiotherapy and endoscopy imaging	No – these will be the subject of supplementary business cases if/when these services are required	Yes, based on outcomes of the core PACS & RIS procurement, but only to commit the suppliers to provide these services if/when they are requested, and not to commit the Trust to purchasing them up front
CR modalities and workstation support	Yes, based on estimated costs of supporting the existing CR modalities and workstations that are inherited from Accenture	Yes, based on outcomes of procurement of these services
CR modalities and workstations replacement	Yes, based on estimated costs of replacing the existing CR modalities and workstations that are inherited from Accenture based on an assumed refresh timetable	Yes, based on outcomes of procurement of these services

Figure 1 – Scope of This FBC

1.2.4 What Is The Best Solution For The Core PACS/RIS?

The PACS/RIS Outline Business Case demonstrated that the best solution was to procure a new PACS/RIS solution collaboratively along with other local Trusts in a procurement consortium (since termed EMRAD) using the Official Journal of the European Union (OJEU) Competitive Dialogue procedure. It also confirmed that the new solution should be hosted externally and should have a flexible configuration and the ability to share images and reports with other healthcare organisations.

The EMRAD collaborative procurement has reached the point where a preferred PACS/RIS bidder has been identified. The Commercial Case of this FBC explains how the procurement

was undertaken and the results of the evaluation of bidder responses. The outcome is that the recommended preferred bidder is GE Healthcare Clinical Systems (UK) Ltd. The following table summarises how this conclusion was reached by presenting the outcomes of the supplier evaluation model.

Criteria	Weighting	Sub-Criteria	Sub - Weighting	Accenture (UK) Limited	GE Healthcare Clinical Systems (UK) Ltd
Product functionality and fit	30%	Immediate / Core Functionality	25%	18.89	18.16
		Long Term Functionality (product roadmap)	5%	3.00	3.88
Technical capability & fit	15%	System integration	5%	3.46	3.72
		Conformance to recognised technical standards	5%	3.13	4.00
		Information Governance and IT security	5%	3.27	3.74
Deployment & Support Services	25%	Service Continuity and Availability	5%	3.46	3.75
		Project delivery plan	5%	3.79	3.79
		Product and Operational Support	4%	3.00	3.09
		System configuration, data migration and acceptance testing	8%	6.00	6.00
		Training	3%	2.25	2.25
Organisational fit	5%	Working practices of Bidder	1%	0.75	0.75
		Approach to risk sharing and management	2%	1.50	1.50
		Bidder workforce	2%	1.50	1.50
Financial	25%	Whole Life Cost	17.5%	7.85	17.5
		Added Value, Service Credits and Incentives, Key Performance Indicators	7.5%	5.45	5.63
			Total	67.30	79.26
			Rank	2	1

Figure 2 – Outcome of Supplier Evaluation

1.2.5 Value For Money

The Economic Case of this FBC confirms the value for money of the proposed solution. The outcome is summarised in the diagram below.

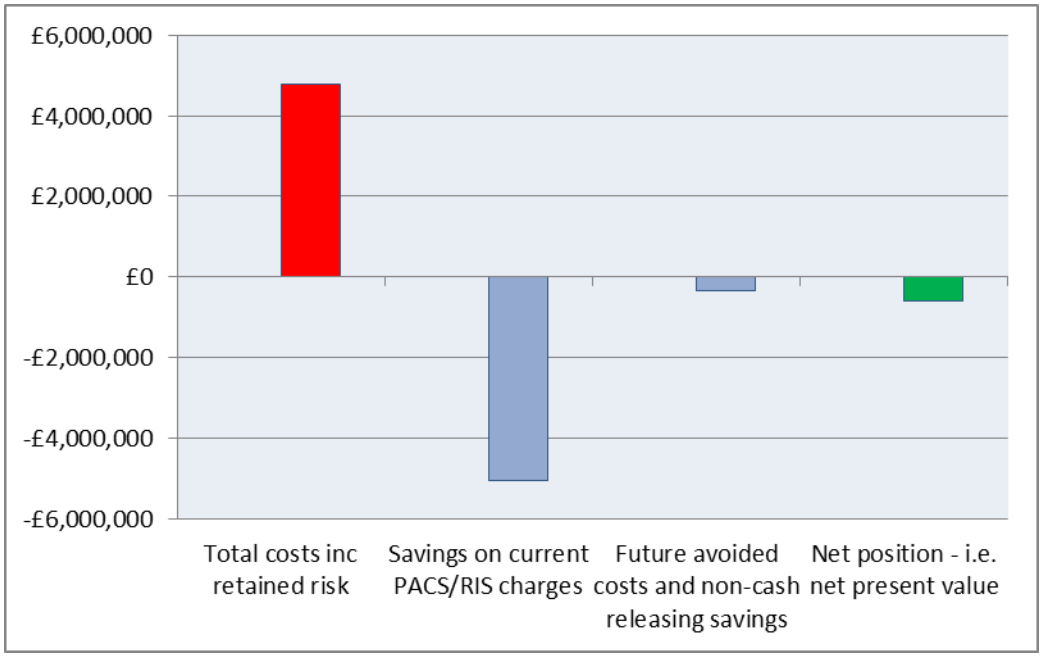


Figure 3 – Value For Money Outcome

The total costs (including the cost of retained risk) associated with the new PACS/RIS solution are similar to the existing PACS support payments with the added advantage that refresh of the imaging CR equipment (with upgrades to DR where applicable) and refresh of diagnostic workstations has been included as these are essential to the provision of a PACS service (although outside of the EMRAD procurement), with the position being improved further by the non-cash releasing time savings and future avoided costs benefits that have been quantified financially. If the purchase of CR equipment and diagnostic workstations can be via a managed equipment service then capital charge of £1.2M can be avoided, strengthening the Value For Money position.

In addition, there are several very significant new quality benefits plus additional non-cash releasing and future avoided cost benefits that could not be quantified by the time this FBC was presented. Collectively these improve the value for money position further again, and the project team will take approval of this FBC as a cue to continue to pursue these with the aim of realising more than have been quantified here.

1.2.6 Funding Requirement

The funding requirement has been calculated by taking the costs from the value for money appraisal (including for the refresh of connected devices such as CR and workstations) and then:

- Adding contingency, irrecoverable VAT and inflation.
- For operating expenditure, adding in capital charges to show the net income and expenditure position.

The results are shown in the following tables, first for capital and then for revenue.

Capital summary £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
PACS /RIS supplier charges	0	0	0	0	0	0	0	0	0	0	0	0
Trust deployment costs	0	0	0	0	0	0	0	0	0	0	0	0
Trust operational costs	0	0	0	0	0	0	0	0	0	0	0	0
CR equipment	0	574,968	0	0	0	0	0	0	0	0	0	574,968
Diagnostic workstations	0	0	0	296,615	0	0	0	0	335,593	0	0	632,209
Contingency **	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL	0	574,968	0	296,615	0	0	0	0	335,593	0	0	1,207,177

Figure 4 – Estimated Funding Requirement - Capital

The capital funding requirement over the investment life is £1.207M, comprising the replacement of existing CR modality medical equipment and Radiology Workstations. Both of these would need to be replac regardless of the new PACS/RIS. However, both could be procured via Managed Equipment Services if required which would remove £1,207M of capital charges from the Operating Expenditure below, but would obviously require the addition of the Managed Service costs.

Operating expenditure summary £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
PACS /RIS supplier charges	0	182,599	320,540	328,874	337,096	345,524	354,162	363,016	372,091	381,393	453,276	3,438,572
Trust deployment costs	39,010	388,759	0	0	0	0	0	0	0	0	0	427,769
Trust operational costs	19,814	74,733	85,599	87,824	90,020	92,271	94,577	96,942	99,365	101,849	121,045	964,039
CR equipment support	0	0	0	0	0	0	0	0	0	0	0	0
Diagnostic workstations support	0	0	0	0	0	0	0	0	0	0	0	0
Contingency **	0	221,532	11,875	11,714	12,007	12,307	12,615	12,930	13,253	13,585	18,836	340,652
Total operating expenditure	58,824	867,623	418,014	428,413	439,123	450,101	461,353	472,887	484,710	496,827	593,157	5,171,032
Operating savings via cash releasing benefits	0	-375,094	-658,565	-675,688	-692,580	-709,895	-727,642	-745,833	-764,479	-783,591	-927,242	-7,060,612
Income from ASR of PACS RIS services	0	0	0	0	0	0	0	0	0	0	0	0
Net operating expenditure position	58,824	492,528	-240,551	-247,276	-253,458	-259,794	-266,289	-272,946	-279,770	-286,764	-334,085	-1,889,580
Capital charges	0	56,554	56,554	92,874	92,874	92,874	92,874	92,874	198,851	198,851	231,993	1,207,177
Net income and expenditure position	58,824	549,083	-183,997	-154,401	-160,583	-166,919	-173,414	-180,072	-80,918	-87,913	-102,092	-682,404

Figure 5 – Estimated Funding Requirement - Revenue

With contingency and capital charges included and once the cash releasing savings are netted off, the investment will begin to generate a positive margin during financial year 2016/17 and will generate an I&E surplus of £682k over the entire lifetime. However, without additional support or savings there is an I&E shortfall in financial years 14/15 and 15/16, which will increase the Trust deficit. This reflects the significant deployment costs that are incurred up front and also the significant contingency contribution to cover the retained risk should it occur.

The operating expenditure is net of cash releasing benefits of approximately £7M including irrecoverable VAT and inflation. These arise mainly from no longer having to pay supplier maintenance and support charges for the existing LSP PACS/RIS service.

A significant contingency sum is included in financial year 2015/16, the majority of which reflects the risks of problems and delays in deploying the new solution. The contingency value has been calculated using a sophisticated probability-based methodology.

1.2.7 How The Funding Requirement Will Be Met

Proposals for how the funding requirement will be met are as follows:

- Capital: adding the capital requirements into the future capital programme allocations
- Income & expenditure: the Trust could seek transitional support from commissioners. Without this and without additional savings this business case increases the Trust deficit for financial years 2014/15 and 2015/16 but contributes to the CIP programme from 2016/17.

1.2.8 What Are The Benefits?

The main benefit comprises the cash-releasing savings associated with no longer having to pay the LSP service charges associated with the existing LSP PACS/RIS service. These savings on their own more than outweigh the costs of the new service over the ten year operational service life.

More than 40 additional benefits have been identified, comprising a mixture of future avoided costs, non-cash releasing savings (in the form of staff time freed up for more productive activities but which cannot realistically be turned into headcount savings) and quality benefits (which result in, for example, reduced patient risk and better quality care). Only some of the future avoided costs, non-cash releasing savings have been fully quantified at the time of

publication of this FBC. However, work is continuing to investigate them, and the project team will take approval of this FBC as a cue to continue to pursue these with the aim of realising more than have been quantified here.

1.2.9 What Are The Major Risks?

Once supplier contracts have been signed the project will move into a transition phase, followed by operational service. Given the scale of the project and the business-critical nature of the service, risks will of course apply. The key is to ensure they are identified and planned for up front. Accordingly a detailed risk assessment has been undertaken during the development of this FBC, aimed at identifying individual risks, their impact should they materialise, what can be done to mitigate them and the consequential retained risk. Full details of this risk assessment are provided in the main body of the FBC; the following table lists the risks that have emerged with the largest retained value.

	Risk Description	Risk Impact	Mitigation
A - Design & Development Risks			
A1	Insufficient user consultation regarding requirements	Requirements built into contract schedules do not meet user needs and new requirements emerge once solution is deployed, requiring supplier to charge for new functionality	Ensure extensive consultation with users regarding their requirements
A2	Documented Trust requirements not sufficiently robust - e.g. specification does not accurately reflect user requirements or is vague/unclear	System modifications required once issues with documented requirements emerge, incurring extra supplier charges to change functionality	Extensive quality assurance of requirements documentation by both Trust and supplier staff
B - Deployment Risks			
B2	New interfaces (e.g. Peer Vue critical alerts, Active Directory access control for on/off-site access and PIX manager interfaces to Trust MPI's) do not work properly plus interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Dedicated Trust ICT interface development team resource available and access to supplier expertise
B3	Suppliers' deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Possible mitigation by including penalty charge on Supplier contract
B4	Trust's deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Robust programme planning and management (evidenced by success of EMRAD procurement stage)

Figure 6 – Main Retained Risks

1.2.10 Governance And Live Services

From feedback during the procurement exercise, it became apparent that there would be significant advantage in having a 'management function' to support the Consortium members deploy the new solutions and to manage the live services environment. Through discussions with the supplier, it became apparent they too would be able to reduce their costs across the consortium by working in this way.

In Governance terms: EMRAD will establish a Board comprising representatives from each organisation in the Consortium and from the EMRAD Live Services Team. This serviced Board will be the driving force behind the solution provided and will use its collective influence with the supplier and externally to ensure effective and continually improving services over the lifetime of the contract.

In 'Live Services' terms: the EMRAD 'Live Services' Team will be the constant support to Trusts in the consortium to ensure the EMRAD solution works effectively and as expected. It is important to note that the supplier costs have reduced significantly on the proviso EMRAD Live Services exists as a single negotiating body for the consortium members and can assisting a co-ordinated approach to both deployments and upgrades over the lifetime of the contract.

1.2.11 Timing

Approval of this FBC will, amongst other things, provide authorisation for the contract with the preferred PACS/RIS supplier to be signed and so for deployment activities to commence. Current anticipated dates for this and other key milestones are as follows:

- Complete contract Terms and Conditions and sign contract: August 2014
- Deployment period: September 2014 to August 2015.
- Go live with new service: September 2015.
- Complete Deployment Verification Period (DVP): October 2015.
- Termination of contract: end-May 2025, thus allowing a ten year operational service, subject to a possible extension of three years plus a two year transition period.

2 Strategic Case

2.1 Introduction

The Strategic Case sets out the strategic requirements for the investment and identifies the case for change. It builds on the equivalent section of the PACS Replacement Outline Business Case, approval of which allowed the procurement exercise to commence.

The case for change is demonstrated by considering the national and local context and drivers. The preferred solution for PACS replacement taken forward for detailed assessment fits the strategic context of the Trust in terms of:

- The Trust's and EMRAD's current position;
- Ability to address the challenges faced by the Trust and EMRAD in relation to the current PACS and pressures on their radiology services;
- Fit with future systems architecture;
- Available functionality (current and prospective); and
- Compliance with international standards.

2.2 Strategic Drivers

2.2.1 Background

'Picture Archiving & Communications System' (or PACS) is the term used to describe an IT system used to acquire, store and retrieve digital images. It is most often, but not exclusively, used to manage digital X-Rays and, in conjunction with a Radiology Information System (or RIS), to schedule, report on and share images either within an organisation or across a wider clinical network. In this format, it has been used extensively across the East Midlands to radically improve the care provided by providing access to appropriate clinical images in multiple settings at the same time. PACS is now well established and part of the essential fabric of health care delivery across the UK.

The majority of Trusts in the East Midlands are currently operating their core PACS systems under a contract with the Local Service Provider (LSP) Accenture. Under the terms of the existing contract Trusts must give notice to the LSP as to when they intend to exit the contract and, if necessary, to enter into an exit transition phase that allows Trusts to extend the contract on a month by month basis until a replacement PACS/RIS is operational. Legal advice has confirmed that the extension period must expire in June 2016 and hence, given the criticality of PACS/RIS to the operation of all Trusts, organisations will have to re-tender for the provision of this service. Those Trusts across the East Midlands who did not contract for PACS with the LSP have independent contracts which expire within a similar timeline.

2.2.2 Relevant National Policy Drivers

The Trust has a clear ongoing obligation to manage the capture, storage and dissemination of radiological images and reports in a systematic and safe manner. On top of this it must be capable of responding effectively to relevant national policies and themes that have a specific consequence for handling and sharing radiological information. These are set out in Appendix A.

2.2.3 Relevant Local Strategic Drivers

The need to replace the current LSP PACS and RIS systems affords the opportunity to address a number of issues and weaknesses inherent in the current services as follows:

- **Service Charges -** High service charges for the existing PACS compared with current market prices
- **Localised PACS and RIS systems and Image sharing** - A PACS and RIS environment within and adjacent to the boundaries of the EMRAD domain which is multi-vendor and together with the limitations of the LSP provided PACS has required all Trusts to introduce workaround solutions in order to share images. Whilst these solutions have been in place for a number of years and worked well the consequences to all participating Trusts have been:
    - Inefficiencies inherent in the image and report sharing processes that constrain further improvements in patient care in relation to multi-disciplinary care meetings, performance of the major trauma network and the Regional Stroke service;
    - An inability to securely share reports associated with images exchanged;
    - Shortfall in PACS functionality, including advanced image processing, and patient dosimetry;
    - A high degree of support needed from appropriately skilled staff to operate the image sharing solution with consequential cost overheads and/or impact on their planned workload; and
    - High rates of image replication and resulting increased storage costs.
- **A year upon year rise** in imaging procedures performed – see Appendix B
- **Limited standards conformance** - Limited adherence to data sharing standards in the LSP PACS including DICOM, HL7 and the overarching IHE framework standard which reduces the ability to fully exploit the capabilities of the overall PACS solutions;
- **No EPR integration strategy** - No clear long term strategy on integrating radiology reports and images with the EMRAD Trusts' patient Electronic Record (EPR) systems.

2.3 The Case for Change

2.3.1 The Trust's Diagnostic Imaging Services

Diagnostic Imaging at Sherwood Forest Hospitals is in the main provided by the Radiology Department which is largely delivered from King's Mill and Newark Hospitals. Additional imaging is performed at the local community hospitals.

Additional diagnostic imaging services are provided by a number of departments at SFHFT:

Department	Function	PACS/RIS Service
Breast Screening	Screening and Symptomatic imaging	LSP provided PACS/RIS
Inhealth (private sector)	MRI	
Radiology	Nuclear Medicine	
Urology	Mobile fluoroscopy	
Endoscopy	Fluoroscopy	

Cardiology		Medcon (stand-alone PACS)
Diabetic Retinopathy	Retinopathy Screening	Stand-alone system (ipOptimize)

Figure 7 – The Trust's Diagnostic Imaging Services

The high volumes of imaging activity for EMRAD trusts is shown in Figure 8. See also Appendix B.

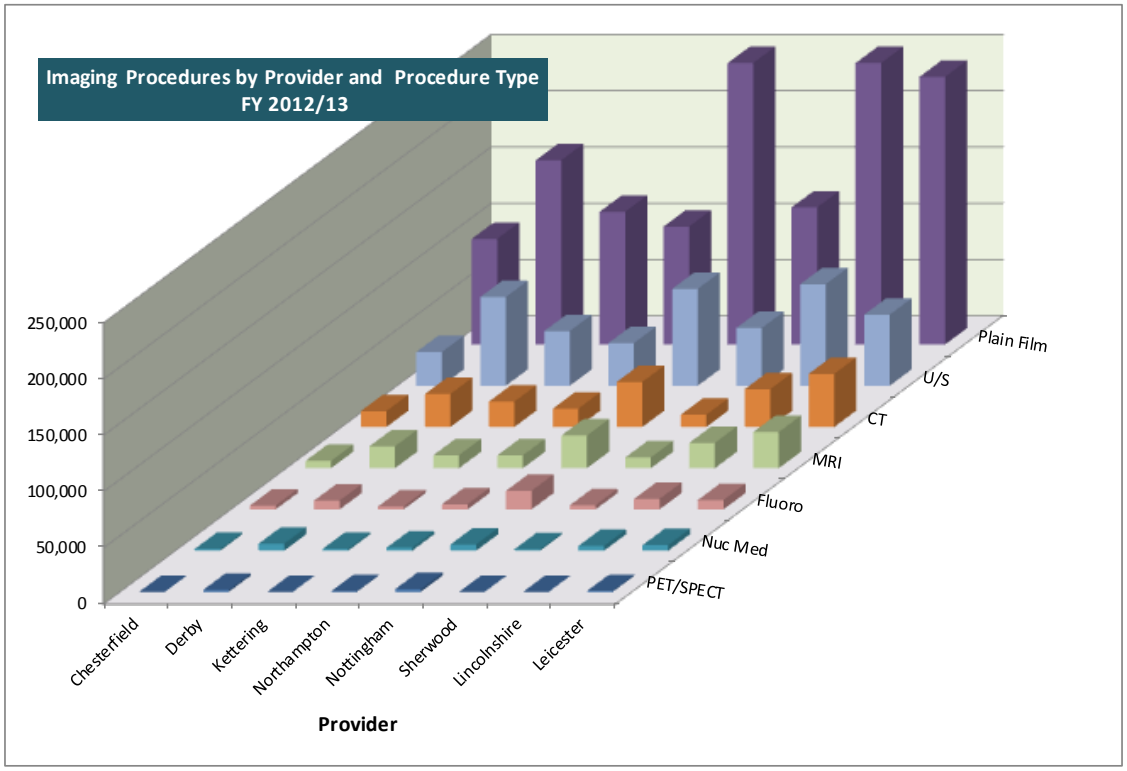


Figure 8 Volumes of imaging activity across EMRAD

2.3.2 Image Exchange Across The EMRAD Domain

Figure 9 shows the significant volumes of image data traffic between the 7 EMRAD Trusts and also from 3 of the Trusts to Sheffield Teaching Hospitals for the six month period between January and June 2013 which is managed using the Image Exchange Portal (IEP). Each of the 22,250 transactions has associated with it a significant administration overhead and results in replication of the transferred image data in the receiving trust's local storage which is then further replicated in the Cluster Data Store which forms the LSP central image archive.

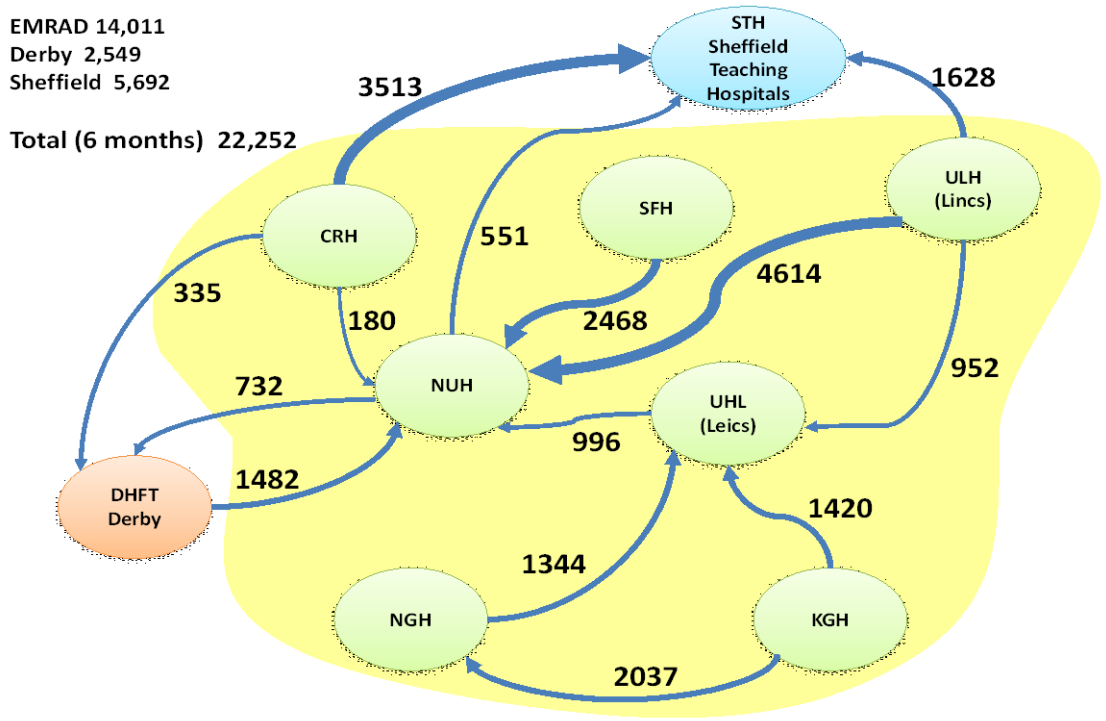


Figure 9 – Image Transfers using IEP January – June2013

2.3.3 Existing Informatics Arrangements

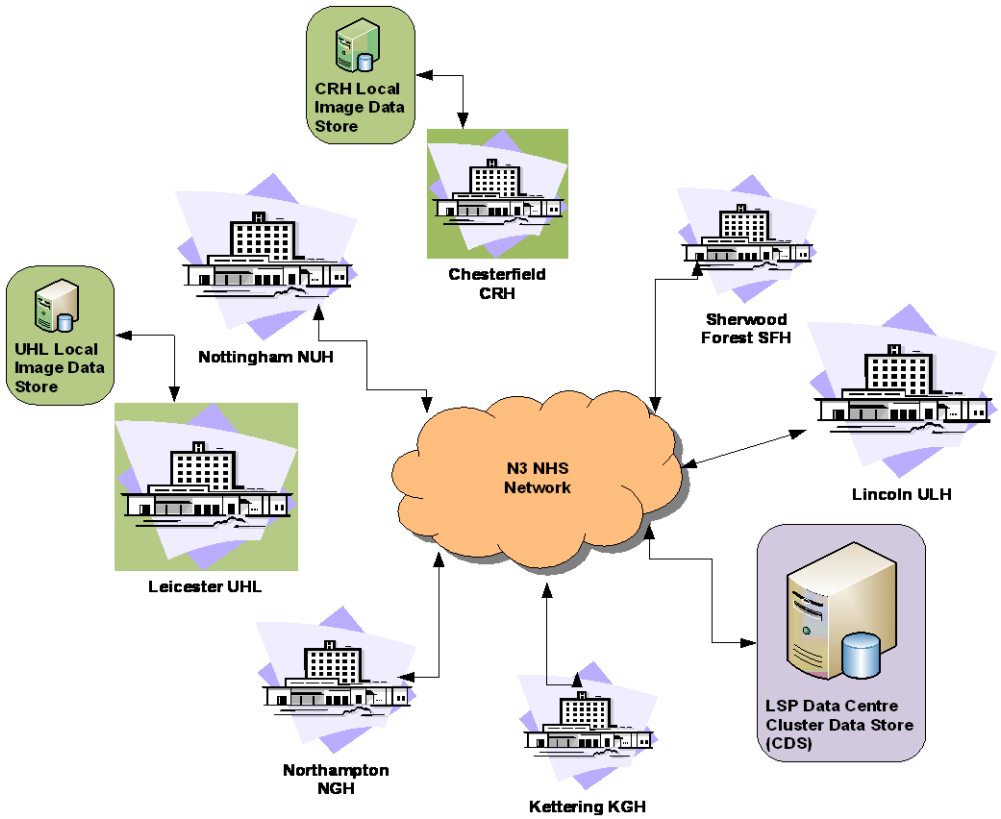


Figure 10 – Current EMRAD IT provision for PACS and RIS

Figure 10 shows the "AS IS" provision of PACS and RIS services across the EMRAD domain. Chesterfield (CRH) use a non-LSP PACS and have a local image archive; Leicester (UHL) use the LSP PACS and have a local image archive; neither of these trusts is connected to the LSP Cluster data store. The Cluster Data Store does not support image or report sharing between Trusts.

2.3.4 PACS Investment scope at SFH

Figure 11 shows the stand-alone imaging systems currently in use alongside the LSP provided PACS and RIS which, together, support the current Radiology and overarching Trust requirements. A number of key data flows (not exhaustive) relevant to these systems are shown including images transferred to and from other NHS organisations via the Image Exchange Portal, order communications and results reporting and synchronisation to the Master Patient Index handled by the Trust Interface Engine. The multiple stand-alone (non-PACS) imaging systems each with their own image storage facility should be noted; these systems are candidates for replacement within the next 10 years using 'Additional Products' which are included in the Wave 1 contract each contributing a potential future avoided procurement cost of between £50K to c. £100K.

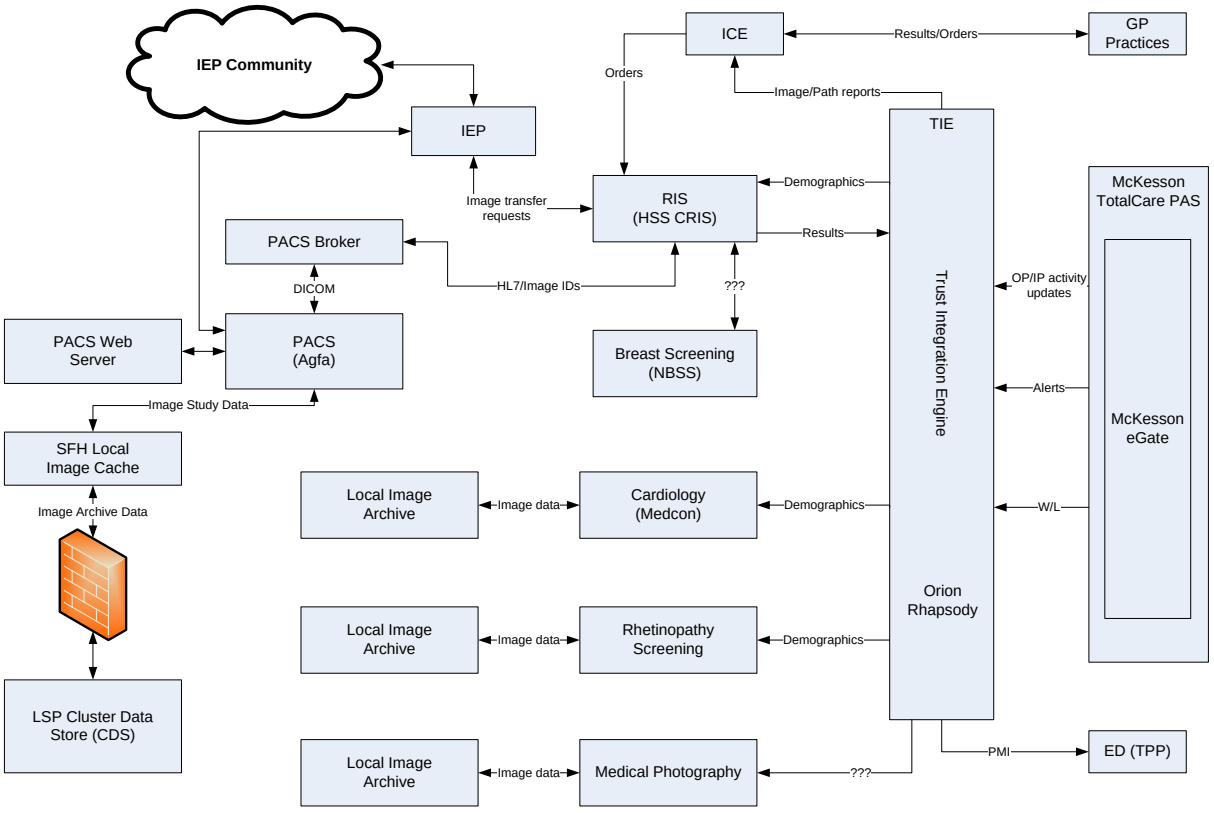


Figure 11 – PACS and IT architecture and Investment Scope at SFH

2.3.5 Service Gaps and Future Business Needs

The current arrangements are not suitable for the future in that:

- The contract for existing LSP PACS/RIS service, which provides informatics support to the Trust's Diagnostic and Rehabilitation directorate, expires in March 2015 and is only capable of being extended on a month by month basis until June 2016;

- The existing PACS/RIS service is high cost compared with current market prices; and
- There are significant limitations with sharing diagnostic imaging information and reports with other healthcare providers that compromise both the delivery of patient care and optimal use of radiology services and resources. This area is explored in detail in Appendix C.

2.4 Investment Objectives

A series of specific objectives for the investment needed in order to deal with these gaps and weaknesses has been defined. They are summarised in the following table.

Ref	Investment Objective
O1	By June 2016 at the latest have in place a stable PACS and RIS system across the Trust that encompasses a replacement for the existing PACS and RIS
O2	Exploit the new PACS/RIS capabilities as rapidly as possible by introducing new working practices
O3	Provide PACS/RIS facilities that are sufficiently agile to support current and future clinical and business needs
O4	Contribute to the Trust's Cost Improvement Programme by providing further economies as compared with the provision of existing PACS/RIS and Radiology services including a potential reduction of 40% in costs as compared with the current PACS and RIS contracts
O5	Provide a high level of PACS/RIS Business Continuity and Disaster Recovery aiming towards "instantaneous failover"

Figure 12 - Investment Objectives And Benefits

2.5 Scope of The Investment

The investment scope for PACS is illustrated in Figure 11 and set in context with the overall technical architecture at SFH; individual areas of the PACS investment are listed in Figure 13.

Included in the scope of the investment are the following:

PACS and RIS core managed services:	- Core PACS services
	- Core RIS services
	- Voice recognition
	- Data storage service
	- Data sharing service
	- Network infrastructure from supplier Data Centre to the Trust (if required to augment existing N3 facilities)
Connected devices:	- Support and refresh of CR modalities - Support and refresh of workstations
Professional services for deployment including:	- Project Management
	- Data Migration (PACS)
	- Data Migration (RIS)
	- System configuration

	- User and technical training
	- Change Management
Integration with existing Trust systems:	- Master Patient Index (MPI)
	- Order Communications
	- Existing imaging modalities
	- NHS Spine services
Professional services if/as required	

Figure 13 – Scope of The Investment

The following items are specifically **excluded** from the scope of the investment:

- Supply and support of specialist PACS & RIS products, such as for cardiology, radiotherapy and endoscopy imaging, as these will be the subject of supplementary business cases if/when these services are required, whilst noting that they will nonetheless be included in the scope of the PACS/RIS contract to the extent that the contract will commit the suppliers to provide these services if/when they are requested, without committing the Trust to purchasing them up front.
- Local area network components, for example any that may be required to conform with the Bidder's Warranted Environment Specification; and
- Investments needed by other Trusts within the consortium in order to secure their own new PACS/RIS service.

2.6 Strategic Risks

A full risk appraisal is set out in the Economic Case. Based on the financial value of the risks identified, the following are considered to be the main ones:

	Risk Description	Risk Impact	Mitigation
A - Design & Development Risks			
A1	Insufficient user consultation regarding requirements	Requirements built into contract schedules do not meet user needs and new requirements emerge once solution is deployed, requiring supplier to charge for new functionality	Ensure extensive consultation with users regarding their requirements
A2	Documented Trust requirements not sufficiently robust - e.g. specification does not accurately reflect user requirements or is vague/unclear	System modifications required once issues with documented requirements emerge, incurring extra supplier charges to change functionality	Extensive quality assurance of requirements documentation by both Trust and supplier staff
B - Deployment Risks			
B2	New interfaces (e.g. Peer Vue critical alerts, Active Directory access control for on/off-site access and PIX manager interfaces to Trust MPI's) do	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Dedicated Trust ICT interface development team resource available and access to supplier expertise

	not work properly plus interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)		
B4	Trust's deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Robust programme planning and management (evidenced by success of EMRAD procurement stage)

Figure 14 – Main Strategic Risks

2.7 Constraints And Dependencies

These are each defined as follows:

- A constraint is something that limits the proposed investment in some way - e.g. funding, staffing resources, competing initiatives, a national target, the organisation's ability to accept change;
- A dependency is something on which the investment depends in order to be delivered - e.g. commissioner and stakeholder support, other related project outcomes or continuation of existing services or availability of external resources.

2.7.1 Constraints

The main constraints identified are:

- The need to have migrated to the new solution in advance of the deadline of June 2016 for the termination of the Trust's current PACS/RIS contract;
- Funding, including future and capital funding for the replacement of end of life Computerised Radiology (CR) equipment and diagnostic workstations in the required timescales;
- The quantity and quality of migrated image and associated patient data;
- The number of staff who require training;
- The need to work within constraints agreed with EMRAD partners, for example, slot planning dates, common reference codes in RIS and workflow processes and policies;
- Clinical Governance including data sharing requirements within EMRAD; and
- Competing initiatives which could cause contention for staffing and financial resources, including:

Projects current and planned	**Target start and end dates**
PAS replacement	Current – October 2014
Order Communications/Results Reporting	Current – TBA
PAS extended use/exploitation post go-live (phased)	October 2014 – TBA
e-Prescribing	Under review
Replacement of ORMIS Theatre system	TBA
Partnership projects with neighbouring trusts	September 2013 – March 2015
ICT Programme Portfolio	TBA

2.7.2 Dependencies

The main dependencies, defined as being factors outside the direct control of the project team, are as follows:

- Enhancements required to the trust's infrastructure following a gap analysis against the preferred Bidder's Warranted Environment Specification (WES).
- 3rd party support of existing connected components such as diagnostic workstations and Computed Radiology imaging devices when the LSP contract is terminated and their replacement when they reach the end of their life.
- Availability of existing SFHFT/NHIS technical, clinical and business resources.
- Adequate information interfaces to and from other ICT systems.
- Adequate modality interfacing to the new PACS.
- Adequate resources from the solution supplier.
- Provision of adequate training facilities.

3 Economic Case

3.1 Introduction

An Outline Business Case was prepared for the proposed investment which evaluated the following shortlisted options:

- Option 1 – This option allows for PACS, with maximum functionality including hardware components, and RIS to be procured via the Consortium with flexible configuration capabilities, for example as a single instance of the application software, and optional configurations for the image archive and Disaster Recovery facilities, that will be hosted and managed externally.
- Option 2 – This option allows for PACS, with maximum functionality including hardware components, and RIS to be procured via the Consortium but deployed by the Trust as a stand-alone system with the hosting and management arrangements determined by the Trust.
- Option 3 – This option allows for PACS and RIS to be procured separately by the Trust, that is, outside of the Consortium arrangements, and deployed as a stand-alone system with the hosting and management arrangements determined by the Trust.

It concluded that the preferred option was option 1, and stated that:

'Of the three options, option 1 - consortium procurement, externally hosted, flexible configuration with ability to share images and reports - is superior in that the net present value is highest and the quality benefits are significantly greater'.

None of the key assumptions have changed since the OBC was produced, and as such the original preferred option remains valid.

Following approval of the OBC, the EMRAD consortium was formed and the procurement of a common core PACS/RIS solution was commenced. The procurement has reached the point where a preferred bidder has been identified, with the Commercial Case setting out how this has been achieved. This Economic Case uses the outcomes of the procurement to show the value for money of the preferred bidder's solution plus the estimated costs of supporting and refreshing over time CR and workstations..

3.2 Approach And Assumptions

A detailed Excel-based business case model has been used to undertake the value for money analysis, and is available under separate cover. It does this by setting out the costs, benefits and risks associated with taking forward the preferred bidder's solution.

In undertaking the value for money appraisal the following assumptions have been made regarding timescales:

Aspect	Start Date	Finish Date	Elapsed Time
Contract period	Start-September 2014	End-May 2025	10 years 9 months
Deployment	Start-September 2014	End-August 2015	11 months
Operational service	Start-June 2015	End-May 2025	10 years

The following additional assumptions have been made:

- It excludes a possible contract extension of up to three years, and a further two years transition period beyond the three year extension, if needed to de-risk the contract exit, as these would be subject to a separate decision nearer the time.
- It assumes that imaging activity at SFHFT will remain essentially 'as is', whilst recognising that image storage requirements will increase as image technology and practice changes and that higher service availability levels will be required by end users.
- It uses the current steady-state position as the baseline and shows how costs, benefits and risks vary from this position. For example:
    - Benefits associated with operating the existing PACS solution are assumed to already be in the baseline, and so the benefits shown are additional benefits over and above those already realised.
    - A major element of the costs comprises supplier charges for maintaining and supporting the new PACS/RIS service once it is operational. However, conversely the Trust will no longer need to pay service charges for the current PACS/RIS. For the sake of the value for money appraisal these service charges are shown as cash releasing benefits up until the end of the investment life of this business case.

3.3 Costs

The cost model works by calculating the value of the following components:

- Supplier deployment charges.
- Supplier charges for a managed core PACS/RIS service over the ten year contract life.
- Supplier charges for support and refresh over time of CR and workstation devices.
- Trust staffing effort required during the transition to, and subsequent operation of the new service.
- Trust contributions towards the cost of running the EMRAD consortium.
- Technical infrastructure investments needed in order for the new service to operate.

Note that:

- New CR devices and diagnostic workstations for the Trust are included.
- The £50,000 procurement consortium membership cost has been removed from the FBC comparator positions as this cost has already been forecasted and funded via EMRAD contributions and are classed as sunk costs.

Full details of the costs are provided within the detailed Excel business case model that is available under separate cover. Appendix D explains the source of the costs, with Appendix E setting out the costs themselves over time. The table below summarises the outcomes in terms of the total costs (excluding VAT, contingency and inflation) over the investment life.

Costs - FBC position (all costs £ exc VAT)	Cost explanation	(C)ap/ (R)ev	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total
			14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	
Capital			£0	£467,910	£0	£229,755	£0	£0	£0	£0	£229,755	£0	£0	£927,420
Revenue			£58,824	£620,068	£387,324	£387,324	£387,324	£387,324	£387,324	£387,324	£387,324	£387,324	£451,878	£4,229,366
Total			£58,824	£1,087,978	£387,324	£617,080	£387,324	£387,324	£387,324	£387,324	£617,080	£387,324	£451,878	£5,156,786

Figure 15 – Total Costs Over Investment Life

The preferred supplier's charges emerging from the procurement are lower than was estimated at OBC stage but Trust deployment and operational costs are higher and CR and diagnostic workstation costs are now included, whereas they were not at OBC stage.

3.4 Benefits

A range of individual benefits has been identified and valued or scored through a benefits assessment exercise.

Each benefit was classified into one of the following categories:

- Financial cash releasing – such as supplier service charges for the existing PACS/RIS service that will not be incurred in future years.
- Financial non-cash releasing – such as savings in staff time savings or other resources that is put to better use rather than being realised as cash savings.
- Future avoided costs – namely new costs that are likely to be incurred if the investment was not made but which are not factored into budgets and so cannot be counted as true cash-releasing savings (and so cannot be used to help pay for the new investment). An example is no additional procurements being needed for the "ologies" as these may be taken from the "Additional Services" provided under the contract.
- Quality benefits – namely benefits that cannot be quantified in financial terms and so are instead scored.

Appendix F presents a description of all of the potential benefits identified during this process.

Note that for those financial benefits (cash releasing, non-cash releasing and future avoided costs) that occur each year, a 'kick-in' profile has been used to reflect the reality that some will not be incurred 100% from day one but will ramp up over time.

3.4.1 Financial Cash Releasing Benefits

Two cash releasing benefits were identified during the benefits appraisal:

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
RA01	A PACS that replaces the current LSP PACS service	Can terminate existing PACS contract with LSP	No longer need to pay related LSP service charges on assumption these would continue in future years
RA02	A RIS that replaces the current RIS service	Can terminate existing RIS contract	No longer need to pay related service charges on assumption these would continue in future years

Figure 16 – Financial Cash Releasing Benefits Identified

Appendix G sets out the calculated value of these benefits phased over the duration of the investment, with the following table providing a summary.

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total exc VAT
RA01	A PACS that replaces the current LSP PACS service	Can terminate existing PACS contract w ith LSP	No longer need to pay related LSP service charges on assumption these w ould continue in future years	NHS	CRB		% kick-in PA:	0%	58%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						H	£564,451	£0	£329,263	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£658,526	**£5,503,397**
RA02	A RIS that replaces the current RIS service	Can terminate existing RIS contract	No longer need to pay related service charges on assumption these w ould continue in future years	NHS	CRB		% kick-in PA:	0%	58%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						H	£44,556	£0	£25,991	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£51,982	**£434,421**
TR01	Depreciation of existing PACS assets			Trust	CRB		% kick-in PA:		58%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
						H	£19,050	£0	£11,049	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	**£182,499**

Figure 17 – Financial Cash Releasing Benefits Summary

3.4.2 Financial Non-Cash Releasing Benefits

The following non-cash releasing benefits, in the form of staff time savings where the time saved is expected to be put to more productive use, were identified:

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
TR02	Image data sharing via common hosted image archive	Reduced need for Radiology support staff to burn, import and fix-up CDs	1 band 4 wte time released for core duties because of reduced dependency on CDs for image transfer
RA06	Shared Application Instance	Application upgrades are simpler and quicker	Reduced need for staff to support PACS and RIS application upgrades
RA07a	Image data sharing via common hosted image archive	Reduction in number of image 'retakes' when a patient is transferred between hospitals	Release of current radiology imaging (radiographer) and reporting (radiologist) resources for core duties
IT01	New Managed Service	Reduced dependency on Trust ICT support staff to support Trust hosted PACS and RIS servers	
RA07	Image data sharing via common hosted image archive	The number of points of failure inherent in current IEP technology is considerably reduced	Less PACS admin time spent on remedial work on failed or erroneous image transfers
RA14	Access to global worklists and acquired images via a common PACS and RIS and XDS I capability	the possibility of redistributing radiology reporting capacity according to a virtualised expertise-based rather than geographically-based model.	Current radiology reporting resource time freed up for cross-cover of time-sensitive investigations requiring expert opinion (cover for annual leave, sickness, recruiting gaps etc
M1	Reporting dashboard	Readily accessible and up to date RIS performance dashboard providing relevant and timely management information	Increased Service capacity because of the ability to optimise the utilisation of both the current equipment estate and existing staff resources on the basis of dashboard outputs
DM1	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Radiographer time released to perform core tasks (estimated at c. 10 seconds per imaging study) x150,000 studies/annum = 56 days/annum
DM5	Dose management data analysis	Consistent Imaging procedures established across EMRAD through routine inter-trust comparison of patient exposures	Fewer image retakes when images acquired at one trust are used by clinicians at another trust when a patient is transferred by how much?
DM13	Dose management data analysis	At SFH, reduced load on X-Ray tubes - longer life - cheaper maintenance?	0
TR14	Image and report sharing via common hosted image archive and common RIS	MDT's are organised and performed more efficiently and effectively	Fewer cancelled MDT's due to unavailability of necessary patient data

Figure 18 – Financial Non-Cash Releasing Benefits That Were Quantified

Of these only TR02, IT01 and DM1 were able to be quantified by the time this FBC was produced. Appendix H sets out the calculated value of these benefits phased over the duration of the investment, with the following table providing a summary.

3.4.3 Future Avoided Costs

The following future avoided costs were identified during the benefits appraisal, with Appendix I providing more detail:

Benefits phased over time - FBC position (£)			
Ref	**Enabling functionality/ facility**	**Changed state resulting**	**Description of benefit realised**
TR03	Contract Structure includes "Additional Services"	No additional procurements needed for the "ologies" as these may be taken from the "Additional Services" provided under the contract	Future avoided cost of procuring PACS solutions for Cardiology, Endoscopy, etc
TR09	Common radiology IT system (RIS) across multiple EMRAD trusts	Development of future unified IT networks based on sharing agreements and infrastructure provisioned by EMRAD procurement	Improved IT networking between EMRAD Trusts with scope to develop and deploy further systems/architecture along similar lines (e.g. EPR)
TR10	Single RIS instance that includes the required management reporting functions (4.27/28 of ISDS Vol 2)	Automatic transparent activity reports and invoicing between EMRAD Trusts where reporting has been undertaken by one Trust at the behest of another; payments processed more quickly.	Reduced cost of administrating the requesting/invoicing cycle
TR16	Common radiology IT system (RIS) across multiple EMRAD trusts	More streamlined operational services for Radiology which is more able to cope with increased imaging workload	Reduced need to additional in-house radiological staffing resources in response to higher workload

Figure 19 – Future Avoided Costs

Of these only TR03 was able to be quantified by the time this FBC was produced. The value of this benefit at OBC stage (after the inflation adjustment) was £102,600; it has now been increased to £200,000 in order to reflect a more realistic sum.

3.4.4 Quality Benefits

The following quality benefits were identified during the benefits appraisal, with Appendix J providing more detail:

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
RA08	Externally hosted solution with resilient, secure high bandwidth WAN connections from the data centre to the Trust	'Instantaneous failover' as part of managed service hence increased availability of PACS/RIS	Reduction in disruption to patient services
RA09	Image data sharing via common hosted image archive	The number of points of failure inherent in current PACS technology will be considerably reduced	Reduced loss of clinical productivity
DM2	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Reduction in transcription errors and reduction in missing data allowing legally compliant individual IRMER 2000 patient records
DM3	Dose management data analysis	Radiation dose information fed back routinely to referring clinicians	Potential improvement in clinician referral practice - e.g. reduction in unnecessary procedures and patient exposure

DM4	Dose management data analysis	Radiation dose information monitored routinely against diagnostic reference levels as required by IRMER 2000	Non-compliance with current IRR99 and IRMER 2000 legislation and future legislation mitigated with reduced probability of CQC and HSE enforcement notice and associated fines
DM6	Dose management data analysis	NUH patients receive reduced doses due to improved practice	Reduced risk of inducing a fatal cancer for patients with long standing illness or severe injury particularly in young patients
DM8	Dose management - high dose alert functions	Radiation doses are monitored routinely against expected (acceptable/benchmarked) levels	Immediate indication of accidental overexposures enabling prompt remedial action to avoid repetition and possible need for review of the imaging procedure or operator re-training
DM9	Dose management data analysis	Ability to demonstrate quality of NUH services to patients, staff, commissioners e.g. adherence to national and international best practice	Quality of service i.e. Low radiation doses commensurate with optimum image quality can be demonstrated More patients attracted to NUH / Medical Physics services growth opportunity / opportunities for R&D and publications
DM11	Dose management data analysis	Rogue equipment at NUH identified earlier	Enables early intervention including remedial work on imaging modality and/or de-commissioning / replacement hence ensuring consistent high quality image outputs
DM12	Dose management data analysis	Radiology training / refresher better focused at NUH	Enables more optimal use of training resources through targetted training
TR15	Image and report sharing via common hosted image archive and common RIS	Extensive range of radiology images/reports and images from other specialities/trusts e.g. cardiology/medical photography all available at MDT's	Improved patient outcomes due to fewer repeat exams and better clinical decision making/care planning enabled by higher quality/quantity of clinical findings available

Figure 20 – Quality Benefits

This is a considerably larger set of quality benefits than was identified at OBC stage, where only the first two were presented.

Figure 21 – Quality Benefit Scores

Although they cannot be quantified financially these quality benefits are nonetheless of great importance, particularly those that result in better patient care and lower patient risk.

In addition, the EMRAD acquired system will contribute to Quality, Innovation, Productivity and Prevention (QIPP) and Best Practice Tariffs (BPTs) policies the in the following ways:

Improved Imaging communication both enables and enhances:

- Tertiary referral process.
- The dissemination and availability of expert opinion.
- MDT functionality.
- Cross trust radiology reporting.
- The ability to access radiology reports across Trusts (Does not exist at present).

- Resources required for image transfers between Trusts will be greatly reduced and the ability to share imaging between Trusts 24/7 will minimise clinical risk.
- Enables research and audit to expand to a regional level.
- Enables improvements to quality standards in imaging (standardisation of protocols and wide adoption of proven best practice).

- Looking at regional/national pathways, the enablement of a regionalised RIS and PACS will facilitate performance of the Major Trauma Network with regard to cross-Trust transfer and opinion. This will support the performance of the MTN against the standards set by TARN (the national Trauma Audit and Research Network).

3.5 Risks

A detailed risk appraisal has been undertaken in order to calculate the financial value of risk retained by the Trust (noting that some risks can at least in part be passed to the supplier), so that this can be used both to feed into the overall value for money position and also to generate a contingency amount for inclusion in the Financial Case. Full details are presented in Appendix K.

The main risks identified and the extent to which each contributes to the overall level of risk retained by the Trust are presented in the following table.

	Risk Description	Risk Impact	Mitigation	Principal owner
A - Design & Development Risks				
A1	Insufficient user consultation regarding requirements	Requirements built into contract schedules do not meet user needs and new requirements emerge once solution is deployed, requiring supplier to charge for new functionality	Ensure extensive consultation with users regarding their requirements	Trust
A2	Documented Trust requirements not sufficiently robust - e.g. specification does not accurately reflect user requirements or is vague/unclear	System modifications required once issues with documented requirements emerge, incurring extra supplier charges to change functionality	Extensive quality assurance of requirements documentation by both Trust and supplier staff	Trust
A3	Supplier configuration design is inappropriate - for example by not accurately reflecting user and business process requirements or through inappropriate use of system parameters	Extra resources required to rectify supplier configuration and to retrain users once rectified	Extensive user acceptance testing (potentially mitigated in GE case by Extra resources in EMRAD multi-trust multi-expertise team - slack in go-live deadline	Trust
A4	Users not sufficiently engaged in project - e.g. regarding overall objectives, selection of preferred supplier, deployment timescales, impact on them during implementation and once service is live	Users do not play their part in the deployment, and subsequent use of the solution resulting in low take-up of solution and reduced benefits	Extensive communication and engagement with users throughout the project Bidder selection processes, deployment timetable, configuration of the solution, adequate training and on-going specialist local resource to ensure best practice use of the solution	Trust
B - Deployment Risks				
B1	Image data migration time and/or complexity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team	a) Image Data extraction ('data localisation') is accomplished within the agreed exit plan to be	Supplier

		retained for longer	performed within the current LSP contract for PACS and b) data migration into the new PACS has relevant contingency/tolerances applied.	
B2	New interfaces (e.g. Peer Vue critical alerts, Active Directory access control for on/off-site access and PIX manager interfaces to Trust MPI's) do not work properly plus interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Dedicated Trust ICT interface development team resource available and access to supplier expertise	Trust
B3	Suppliers' deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Possible mitigation by including penalty charge on Supplier contract	Shared 50:50 with supplier
B4	Trust's deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Robust programme planning and management (evidenced by success of EMRAD procurement stage)	Trust
C - Operational Risks				
C1	Supplier's product does not meet Trust functional requirements ready for DVP	Separate functionality has to be implemented and interfaced in order to satisfy missing requirements	Ensure preferred supplier has confirmed it can meet all requirements prior to signing contracts	Trust
C2	New legislative or regulatory changes require new functionality that is outside the original requirements	Supplier needs to modify system in order to meet new requirements and charge the Trust accordingly	Compliance stipulated in ISFT and in contract	Trust
C3	Supplier's product does not meet Trust performance requirements, causing loss of productivity in the form of reporting backlog and delays to patient pre-imaging processes	Need to hold additional reporting sessions to clear backlog and employ extra temporary staff to manage patient appointments etc and do remedial work to fix the problem	Ensure appropriate service performance levels are set to benchmark system load testing prior to DVP and throughout operational life	Supplier
C4	Loss of service based on supplier provided / managed component , for example due to data centre(s) failure	Business as usual (BAU) impact (patient care) and need to hold additional reporting	Highly replicated system including 2 x Data Centres and failover to local SAP/cache components	Shared 50:50 with supplier

		sessions to clear backlog and employ extra temporary staff to manage patient appointments etc	and service points in contract	
D - Termination Risks				
D1	Major commercial problems emerge such as supplier bankruptcy or dispute over contractual responsibilities	Need to negotiate alternative arrangements with supplier or in worst case procure a new supplier	Oblige supplier to notify changes in financial stability and ensure they understand and agree to everything they sign up to. Include within the contract a financial distress schedule giving the Trust remedies should the supplier's financial health fail - software held in Escrow - achieve BAU with new supplier in data centre	Supplier
D2	Trust seeks early termination (for whatever reason)	Penalty charges for early termination in supplier contract	Robust procurement process that supports Trust long term plans + sign-off at board level and NTDA	Trust

Figure 22 – Outcome of Risk Evaluation

Risks A1, A2, B2 and B4 are the main strategic risks, between them comprising more than 60% of the total risk retained by the Trust. The Management Case explains more about how risks are being managed as the project progresses.

3.6 Optimism Bias

Optimism bias refers to the known tendency for the costs of projects to be underestimated, particularly in the early stages of developing and costing projects (e.g. SOC and OBC). The adjustment for optimism bias is a requirement of Department of Health (DH) and HM Treasury to make explicit, upward adjustments to costs to counteract this known tendency.

An optimism bias assessment was undertaken in line with the most recent DH guidance for applying optimism bias to ICT schemes, in accordance with HM Treasury's latest Green Book. The process involves performing the following steps against each of a set of standard contributory factors:

- Decide on the upper bound percentage.
- Apply mitigating factors to the upper bound percentage.
- Apply the resulting, lower optimism bias rate to the contributory factor.
- Uplift the costs according to the level of the resulting optimism bias.

The guidance states that at FBC stage (i.e. this business case) the level of remaining optimism bias after mitigation should be very low or zero, as any remaining significant risks should instead be expressed through a detailed, quantified risk analysis.

The guidance also states that the upper bound percentage should be set at what is considered to be an appropriate level, using the following guidance:

- 40% if the system and interfaces are standard products already fully developed and proven (there is practically no new coding).
- 100% if the system and interfaces use a number of standard applications but also adds or develops further functionality and has a significant degree of new coding.
- 200% if the system and interfaces are new and untried before (involving a high degree of new coding).

For this investment the optimism bias upper bound has been set to 100% on the basis that the PACS solution is largely a proven and largely standard service.

Appendix L presents the outcomes of the optimism bias assessment. The optimism bias has been set to zero for those contributory factors that are already costed within the risk assessment presented earlier. The outcome is that all of the optimism bias factors have been addressed through the risk assessment, and so to avoid double counting no optimism bias uplift has been applied.

3.7 Resulting Value For Money Position

3.7.1 Value For Money Outcome

Appendix M presents the value for money of the preferred bidder's solution based on the total costs, risks and benefits, and compares the outcome with the anticipated value for money position stated within the OBC. The results are summarised below, where all financial figures are in £. The first table presents the 'undiscounted' figures at today's prices, with the second table using 'discounted" figures – i.e. with future costs translated into their current value - so as to generate net present values.

Summary - undiscounted (all financial figures £ exc VAT)	FBC position
Capital expenditure exc VAT	-927,420
Revenue expenditure exc VAT	-4,229,366
Total expenditure exc VAT	**-5,156,786**
Plus cost of risk retained	-444,611
Less cash releasing benefits	6,120,317
Less future avoided costs	200,000
Less non-cash releasing benefits	186,687
Total - undiscounted (highest +ve figure = best)	**905,607**
Risk Score	**0**
Quality benefits score	**281**

Summary - discounted	FBC
Capital expenditure exc VAT	-833,792
Revenue expenditure exc VAT	-3,553,452
Total expenditure exc VAT	**-4,387,244**
Plus cost of risk retained	-401,395
Less cash releasing benefits	5,046,823
Less future avoided costs	174,288
Less non-cash releasing benefits	154,376
Net present value	**586,849**
Risk Score	**0**
Quality benefits score	**281**

Figure 23 – Net Present Value

Please note the costs above are for the value for money appraisal and do not represent the funding requirement, which is described later in the Financial Case.

The position is that:

- The total costs (including the cost of retained risk) associated with the new PACS/RIS solution are similar to the existing PACS support payments with the added advantage that refresh of the imaging CR equipment (with upgrades to DR where applicable) and refresh of diagnostic workstations has been included as these are essential to the provision of a PACS service (although outside of the EMRAD procurement), with the position being improved further by the non-cash releasing time savings and future avoided costs benefits that have been quantified financially. If the purchase of CR equipment and diagnostic workstations can be via a managed equipment service then capital charge of £1.2M can be avoided, strengthening the Value For Money position. The position is improved further by the non-cash releasing time savings and future avoided costs benefits that have been quantified financially. This is demonstrated by the diagram below (which uses the 'discounted' figures).
- The end result is a negative net present value (the third from last row in the table above and the final bar in the chart below).

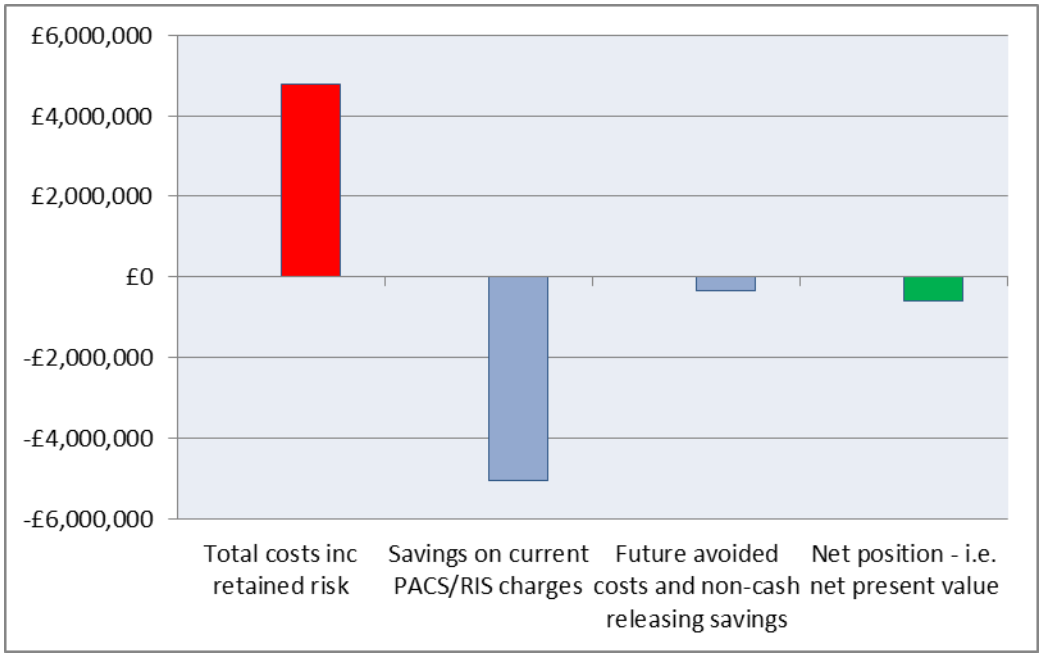


Figure 24 – Value For Money Summary

In addition, there are several very significant new quality benefits plus additional non-cash releasing and future avoided cost benefits that were not able to be quantified by the time this FBC was presented. Collectively these improve the value for money position further again, and the project team will take approval of this FBC as a cue to continue to flesh out these benefits with the aim of realising more than have been quantified here.

3.8 Sensitivity Analysis

3.8.1 'Downside' Scenario

A specific sensitivity test was undertaken to explore the impact on value for money of the size of the consortium reducing to fewer than the critical mass of 3 Trusts (at which point some supplier charges would increase). This was done by removing from the value for money equation the 'shared' benefits that are reliant on other Trusts (e.g. those to do with image sharing) and increasing the PACS/RIS supplier hosting charges plus the Trust's share of the EMRAD team costs. The results are presented below.

Summary - undiscounted (all financial figures £ exc VAT)	FBC position
Capital expenditure exc VAT	-927,420
Revenue expenditure exc VAT	-4,499,032
Total expenditure exc VAT	**-5,426,453**
Plus cost of risk retained	-446,430
Less cash releasing benefits	6,120,317
Less future avoided costs	200,000
Less non-cash releasing benefits	186,687
Total - undiscounted (highest +ve figure = best)	**634,121**
Risk Score	**0**
Quality benefits score	**119**

Figure 25 – Impact On VFM Of 'Downside' Scenario

The result is that the net present value reduces as a consequence of increased costs and reduced benefits.

3.8.2 'Upside' Scenario

A further sensitivity test was undertaken to explore the impact on value for money of realising the additional non-cash releasing and future avoided cost benefits that, as described earlier, have been identified but have yet to be valued. In the absence of them being valued, this was done by assuming that they collectively result in a 20% uplift in the total non-cash releasing and future avoided cost benefits. The outcome is as follows.

Summary - discounted	FBC
Capital expenditure exc VAT	-833,792
Revenue expenditure exc VAT	-3,553,452
Total expenditure exc VAT	**-4,387,244**
Plus cost of risk retained	-403,317
Less cash releasing benefits	5,046,823
Less future avoided costs	209,146
Less non-cash releasing benefits	185,251
Net present value	**650,660**
Risk Score	**0**
Quality benefits score	**281**

Figure 26 – Impact On VFM Of 'Upside' Scenario

The result is a small further increase in the net present value of the investment.

3.9 Conclusions

The analysis in this Economic Case has demonstrated that:

- The investment generates a positive net present value, on account of the total costs (including the cost of retained risk) associated with the new PACS/RIS solution being more than outweighed by the benefits over the lifetime of the investment.
- Value for money has improved further since OBC stage now that the procurement has concluded and the costs, benefits and risks have been refined.
- Value for money is not sensitive to the number of EMRAD Trusts reducing to fewer than the critical mass of 3 Trusts (at which point some supplier charges would increase and some benefits would reduce)

4 Commercial Case

4.1 Introduction

This section describes the commercial arrangements associated with this investment.

4.2 Scope Of Required Services

The components covered and how they will be sourced and are summarised below.

Components covered	How sourced?
Core PACS and RIS services and support	Via a contract resulting from the core PACS and RIS Competitive Dialogue procurement
Supply and support of specialist PACS and RIS products, such as for cardiology, radiotherapy and endoscopy imaging	Via contract resulting from the core PACS and RIS Competitive Dialogue procurement, but included as optional extras
Replacement of CR modalities	Procurement of replacement equipment and support services using the NHSSC framework (mini-competition)
Replacement of Diagnostic Workstations and Hi-resolution monitors	Procurement of replacement equipment as they reach end of life from ICT 'catalogue' for base units and via the NHSSC framework (mini-competition) for screens

Figure 27 – Sourcing Of Components

The end goal of this project is to deliver a new PACS/RIS service that will:

- Provide continuity of service beyond the termination of the existing PACS/RIS contract in March 2015, with minimal clinical and business disruption throughout the transition period;
- Be based on solutions that are agnostic about image acquisition modalities, image display equipment, image storage and disaster recovery facilities and are capable of supporting additional services including cardiology, endoscopy and pathology;
- Provide image sharing capabilities that use up to date and proven technologies and meet national Information Governance requirements, support patient care pathways, allow optimal use of radiology resources including radiologists, radiographers and PACS administration staff;;
- Be cheaper than the existing service; and
- Use environmentally friendly 'green' solutions.

This will be achieved by the preferred bidder providing the Trust with an off-site managed service that will include the following components:

- Core PACS and RIS application software (including provision of remote access, for example by GPs, and to support home working);
- Flexible and scalable solution components (software, processors and storage);
- Remote hosting and management of the PACS and RIS applications, associated data and system failover to provide a high level of service availability;

- Image archive using VNA (vendor neutral archive that separates the PACS application from the tiered storage hardware;
- Disaster recovery, including use of replicated data centres;
- Image sharing capability including the use of XDSi (allowing cross-enterprise image and document sharing within and potentially external to the EMRAD domain);
- Data migration services for the existing image archive[1] and existing RIS data into the new service;
- Integration services between the new RIS and PACS to:
    - the existing Master Patient Index managed within the new Medway PAS;
    - the Trust's existing Order Entry and Results Reporting system;
    - the Trust's existing Electronic Patient Record (EPR);
    - existing imaging modalities and diagnostic reporting workstations and Trust-wide review workstations (PCs);
    - the existing National Breast Screening Service application;
- Optional PACS imaging applications, including
    - Cardiology;
    - Endoscopy;
    - Nuclear Medicine imaging;
    - Retinopathy imaging;
    - Medical Photography;
    - Pathology imaging; and
    - Oncology imaging;
- PACS Planning and Implementation Services, including:
    - Site Readiness Requirements;
    - Site Survey Report;
    - Solution Design Options;
    - Project management;
    - Change Management;
    - End user and technical training;
    - Cutover planning; and
    - Go Live readiness Assessment;
- Value Added Services, including:
    - Modality DICOM Survey;
    - Legacy RIS connectivity survey;
    - Non-radiology modality integration analysis;
    - On-site Demo's and Accompanied Site Visits;
    - PACS Familiarisation Courses; and
    - Training Needs Assessment.

[1] Migration of legacy image data will be achieved through LSP Exit Plan and new managed service arrangements

4.3 Procurement of PACS/RIS

4.3.1 Procurement Process

The procurement has followed the procurement strategy recommended in the OBC and approved by the SFH Capital Development Group. This involved running an OJEU Competitive Dialogue procurement, whilst leaving the option open to use existing framework agreements to procure any required local image servers and image archive cache, WAN infrastructure, if required, and to connect to Data Centre hosted applications, image archive and Disaster Recovery facilities, and refresh of existing CR and diagnostic workstations.

4.3.2 Members Agreement

EMRAD is a collaboration of the member Trusts that have come together to procure PACS and RIS Services:

- under separate contracts between each of them and the provider ("the Wave One Procurement"); and
- under a framework agreement for the benefit of other NHS bodies ("the Wave Two Procurement").

NUHT has agreed to act as the Co-ordinating Trust for the purposes of the Wave1 and Wave 2 procurements.

Each EMRAD Trust has signed a members agreement[2] (Appendix N), which: creates a framework of detailed rules governing the management of the Programme; establishes the necessary management infrastructure; sets out the roles and responsibilities of the various bodies involved in the Programme; establishes in detail the mechanism by which the costs of the Programme will be calculated and divided between the Members; and demonstrates the strength of EMRAD and the seriousness of its intent to those outside of EMRAD.

4.3.3 Key Document Governance and Approvals

Competitive Dialogue is dependent on extensive documentation, from pre-qualification through to the completion of the evaluation of final tenders, and the parallel activities of development and approval of the investment proposals from Strategic Outline Case to Outline Business Case and finally the Full Business Case. Robust Governance processes have been applied to key document development, review and approval steps and these are summarised in the form of a RACI matrix included at Appendix O which shows the roles of each project member of the EMRAD procurement team and the external advisors. An overview of the governance roles applied to the document development and use lifecycle is summarised in Figure 28.

Role in Document Cycle	*Role Description*
R	Responsible – for ensuring the document was created
A	Accountable – for the actual development of the document and having input to the document development and review
C	Consulted – during the development of the document (and may have input to it and/or reviewed it)
I	Informed – were made aware of and provided with copies of the document as deemed necessary by the Programme Director/Board

[2] Prepared by Browne Jacobson LLP, EMRAD legal advisers

*	Formal document approval

Figure 28 – Document Control

4.3.4 Procurement timetable

The following table summarises the main steps and end-dates involved in the PACS procurement[3]

Activity	End Milestone
Issue Prior Information Notice (PIN)	4th June, 2013
Issue OJEU Notice	17th June, 2013
Issue PQQ and MOI	27th June, 2013
Pre-qualify 5 Bidders to participate in dialogue	1st October, 2013
Issue Invitation to Participate in Dialogue and ITPD documentation pack	28th October 2013
ITPD dialogue with the 5 pre-qualified Bidders	11th – 15th November
Evaluation of ITPD responses and final moderation of scores	17th January, 2014
Issue Invitation to Participate in Dialogue and ISDS documentation pack to 3 remaining Bidders	31st January, 2014
ISDS dialogue with the 3 remaining Bidders	3rd – 5th March, 2014
Evaluation of ISDS responses and final moderation of scores	11th April, 2014
Issue Invitation to Tender and ISFT documentation pack to 2 remaining Bidders	23rd April, 2014
ISFT dialogue (Commercial) with 2 remaining Bidders	1st – 2nd May, 2014
Evaluate tenders and identify preferred bidder	6th June, 2014
FBC Trust Board Approval	31th July, 2014
Notify preferred bidder and debrief unsuccessful Bidders	12th June, 2014
Publish award of contract decision	Following Trust Board approval
End standstill period	July, 2014
Complete contract Terms and Conditions and sign contract	August, 2014

Figure 29 – Procurement Timetable

The OJEU notice was published on 17th June, 2013. A copy of the OJEU notice can be found in Appendix P. The main characteristics within the notice were:

- The procurement scope consisted of seven (7) Trusts comprising EMRAD[4] led by NUHT for administrative purposes and was for the provision of a PACS and RIS under a managed service arrangement;
- Two contracts were sought:
    - a Wave 1 contract: a jointly procured single service contract between each of the EMRAD members and the provider only, for ten (10) years with the option to extend for a further three (3 years) plus an additional 2 years for transition, and

[3] Dates taken from EMRAD Programme plan 14042014

[4] EMRAD is not a legal entity and it is not intended that it will become one

- a Wave 2 contract: a Framework Agreement with the Wave 1 supplier procured solely by NUHT for the provision of similar services as Wave 1 to any NHS body in England under a call-off arrangement lasting for four (4) years.

- A single Prime contractor was required to provide all of the specified managed services, that is, the procurement was not divided into a series of Lots;
- A requirement to deploy the services under the Wave1 contract to all EMRAD Trusts on or before June 2016 when the current LSP contract expires.

4.3.5 Competitive Dialogue Approach

The Competitive Dialogue approach as identified in the OBC preferred option was used as the route to market as ratified by the EMRAD PACS Programme Board on 22nd May,2013. Pursuing this procurement route through the Consortium arrangement has avoided the need to be constrained by a fixed set of solution requirements from the outset of the procurement and has considerably widened the opportunities for key stakeholders representing each Consortium member Trust to actively engage in Bidder evaluation and the iterative development of solution requirements as the procurement has progressed through the ITPD stages. In summary this approach allowed flexibility (until final tender) of: evolving the detailed service requirements (to include "forward looking" products and functionality; contract arrangements, and payment profiles.

The procurement process was owned by NUHT Finance and Procurement who provided specialist guidance on procurement rules and legal aspects throughout including the Pre-Qualification stage, dialogue stages, contract clarification stage, evaluation of Bidder proposals, de-briefing of Bidders and configuration and content of the draft contract. The overall procurement cycle and main stages are summarised in Figure 30.

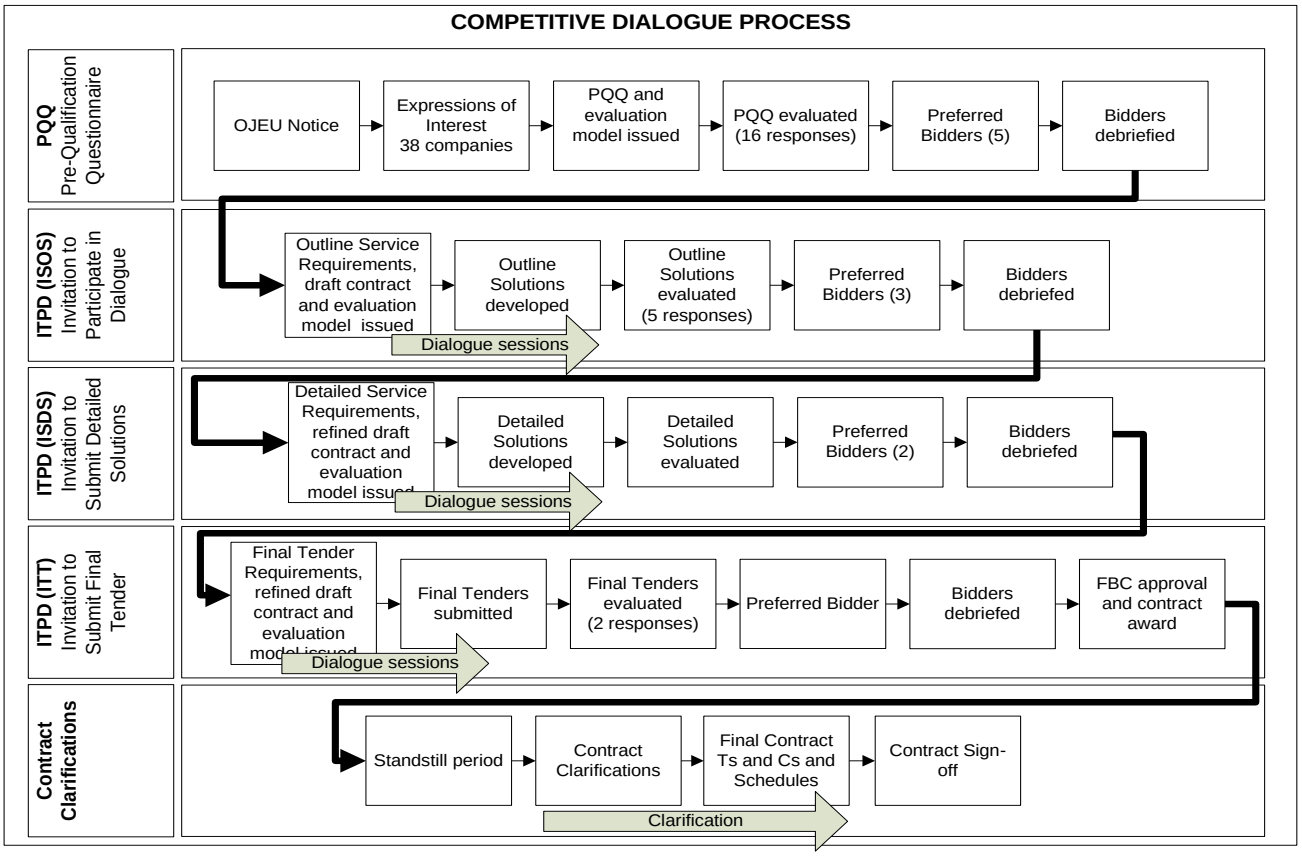


Figure 30 – Procurement Cycle

4.3.6 Evaluation, Scoring and Moderation process

The composition and roles of the five EMRAD Programme workstreams are illustrated in the RACI matrix Appendix O. Workstreams contained a representative from each of the EMRAD Trusts and was led by a member who was either a Senior User or Senior Supplier on the EMRAD PACS Programme Board.

A common evaluation process was applied to Bidder responses at each of the 4 procurement stages - PQQ, ITPD (ISOS), ITPD (ISDS), and ITPD (ISFT) - and the outcomes are detailed in the procurement summary reports in Appendix P. The evaluation and scoring process carried out by the 5 Programme workstreams comprised the following steps (see also Figure 31):

- Prior to scoring and at each procurement stage, each workstream member was provided with an evaluation guide, scoring criteria and a briefing on the evaluation and scoring process;
- Bidder responses and Bidder requirements were provided to individual members of each of the workstreams for evaluation/scoring, resulting in a total of approximately 35 individual sets of scores for each Bidder response);
- Individual sets of scores from each workstream member were collated and then moderated collectively by the workstream lead and workstream members resulting in 5 sets of moderated scores for each Bidder;
- Each moderated workstream score was then further moderated by the EMRAD Programme Board, which included all workstream leads, to produce final set of scores, one set of scores for each Bidder;
- The EMRAD Board then ratified the final scores and the Bidder ranking.

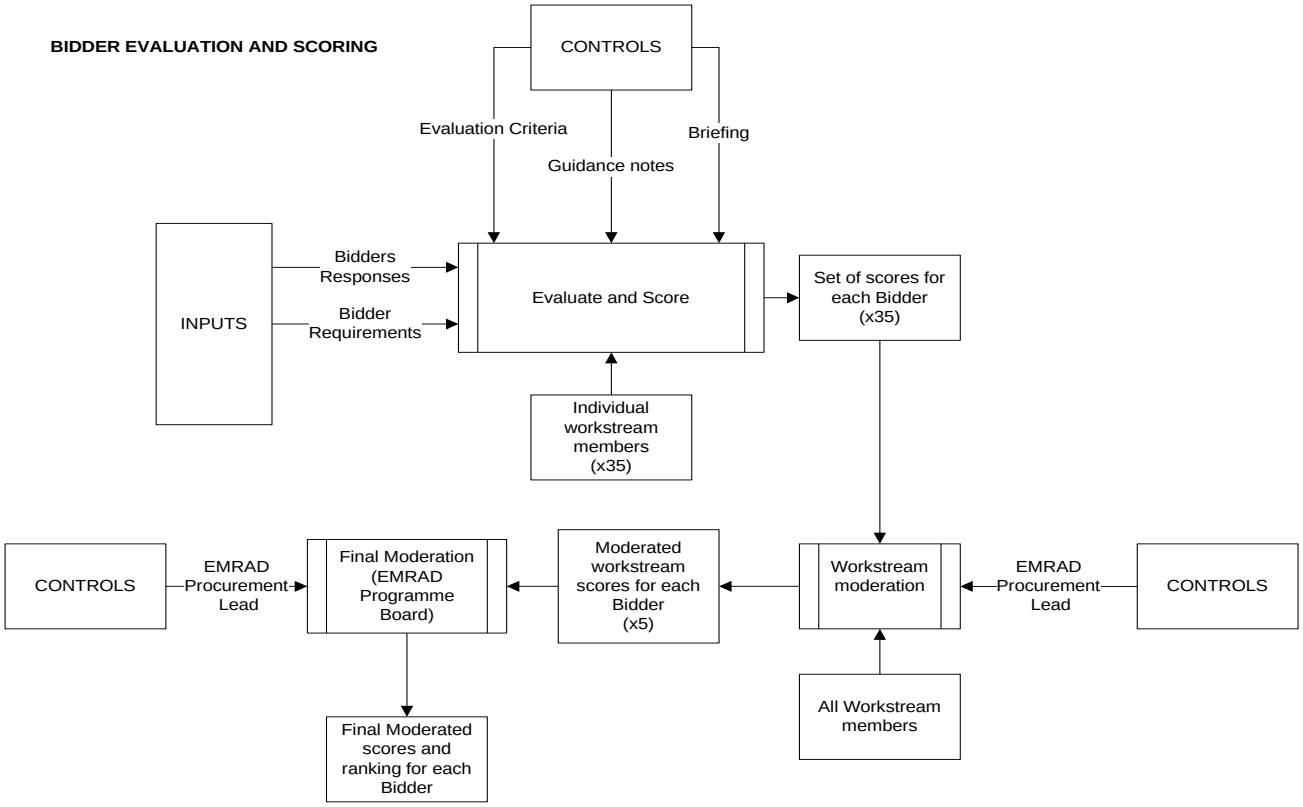


Figure 31 – Bidder Evaluation and Scoring (Generic Process)

4.3.6.1 Pre-Qualification Questionnaire (PQQ stage)

Thirty eight (38) companies downloaded the PQQ material of whom sixteen (16) submitted PQQ responses in accordance with the Trust's OJEU notice. PQQ responses were assessed in terms of the Bidder's financial standing, technical capability and capacity to deliver suitable solutions based on evidence and previous experience.

Of these the top five (5) ranked Bidders, **Accenture (UK) Limited, Carestream Health UK Ltd, GE Healthcare Clinical Systems (UK) Ltd, Insignia Medical Systems Limited and McKesson Information Solutions UK Ltd** were selected and invited to participate in the procurement dialogue stages.

A full PQQ evaluation report including evaluation criteria is included in Appendix P.

4.3.6.2 Invitation to Participate in Dialogue (ITPD) / Invitation to Submit Outline Solutions (ISOS)

The five (5) successful Bidders from the PQQ stage were invited to participate in dialogue and to respond to EMRAD's **Outline Service Requirements**. The Outline Solutions from the five Bidders were assessed and scored with respect to product functionality and fit, technical capability and fit, deployment and support services, organisational fit, and prices.

The outcome of the ITPD assessment was to invite the three highest ranked Bidders, **Accenture (UK) Limited, Carestream Health UK Ltd and GE Healthcare Clinical Systems (UK) Ltd**,to participate in further dialogue.

A full ITPD evaluation report including evaluation criteria is included in Appendix P.

4.3.6.3 Invitation to Participate in Dialogue (ITPD) / Invitation to Submit Detailed Solutions (ISDS)

The three (3) successful Bidders from the ITPD stage were invited participate in further dialogue and to submit final tenders in respond to EMRAD's **Detailed Service Requirements**. The Detailed Solutions from the three Bidders were assessed and scored with respect to product functionality and fit, technical capability and fit, deployment and support services, organisational fit, and prices using refined detailed criteria from the ITPD stage.

The outcome of the ISDS assessment was to invite the two highest ranked Bidders, **Accenture (UK) Limited and GE Healthcare Clinical Systems (UK) Ltd**,to participate in further dialogue.

A full ISDS evaluation report is included in Appendix P.

4.3.6.4 Invitation to Submit Final Tenders (ISFT)

The two (2) successful Bidders from the ISDS stage were invited participate in final dialogue and to submit tenders in respond to **refined set of EMRAD's Detailed Service Requirements**. The tenders from the two Bidders were assessed and scored with respect to product functionality and fit, technical capability and fit, deployment and support services, organisational fit, and prices using refined detailed criteria from the ISDS stage.

The outcome of the ITT assessment was to identify the highest ranked Bidder **GE Healthcare Clinical Systems (UK) Ltd**,as the preferred Bidder.

A full ITT evaluation report is included in Appendix P.

Figure 32 shows the selection criteria, related weightings and the final moderated scores arrived at by EMRAD for the ITT evaluation.

4.3.7 Procurement Outcomes

The following table shows the outcome of the evaluation of the final bidders that were invited to submit final tenders.

Criteria	Weighting	Sub-Criteria	Sub - Weighting	Accenture (UK) Limited	GE Healthcare Clinical Systems (UK) Ltd
Product functionality and fit	30%	Immediate / Core Functionality	25%	18.89	18.16
		Long Term Functionality (product roadmap)	5%	3.00	3.88
Technical capability & fit	15%	System integration	5%	3.46	3.72
		Conformance to recognised technical standards	5%	3.13	4.00
		Information Governance and IT security	5%	3.27	3.74
Deployment & Support Services	25%	Service Continuity and Availability	5%	3.46	3.75
		Project delivery plan	5%	3.79	3.79
		Product and Operational Support	4%	3.00	3.09
		System configuration, data migration and acceptance testing	8%	6.00	6.00
		Training	3%	2.25	2.25
Organisational fit	5%	Working practices of Bidder	1%	0.75	0.75
		Approach to risk sharing and management	2%	1.50	1.50
		Bidder workforce	2%	1.50	1.50
Financial	25%	Whole Life Cost	17.5%	5.45	17.5
		Added Value, Service Credits and Incentives, Key Performance Indicators	7.5%	7.85	5.63
			Total	67.30	79.26
			Rank	2	1

Figure 32 – ITT Selection Criteria and Moderated Scores

Appendix P contains details of the outcomes of the Bidder down selection at each procurement stage.

4.4 Procurement of PACS Image Storage Cache And Related Processing

4.4.1 Procurement Process

The Bidder will provide facilities for local cache storage and processing from day one of the live service located in the Trust but managed remotely under the Bidder's managed service arrangements.

4.5 Procurement of CR Modalities And Workstations

4.5.1 Procurement Process

CR replacement will be undertaken by procuring either through the OJEU restricted procedure or, more speedily, by running a mini-competition between pre-qualified Suppliers on the NHS Supplies Chain framework. Diagnostic workstation replacements will be procured in a similar fashion.

4.5.2 Procurement Outcomes

Indicative costs have been obtained for both CR and diagnostic workstation replacements and are included in the FBC financial analysis. Approval to sign contracts for refresh of the devices will be sought at the time the refresh is required, but with financial cover having been provided up-front via this FBC (see Appendix DAppendix E).

4.6 Contract Details

There will be two types of contract with the successful PACS/RIS Bidder:

- a Wave 1 contract; a jointly procured single service contract between each of the EMRAD members and the provider only, for ten (10) years with the option to extend for a further three (3 years) plus an additional 2 years for transition, and
- a Wave 2 contract: a Framework Agreement with the Wave 1 supplier procured solely by NUHT for the provision of similar services as Wave 1 to any NHS body in England under a call-off arrangement, for four (4) years;

4.6.1 Wave 1 Contract

Each EMRAD Trust will separately sign the Wave 1 contract with GE Healthcare Clinical Systems (UK) Ltd. The terms and conditions and schedules comprising the contract will be essentially the same for SFHFT and each of the EMRAD participating Trusts but the accompanying contract schedules may differ in the scope of the Supplier deliverables and other contractual elements which are dependent upon the size of the Trust (and hence investment scope), deployment and go-live dates as these will be determined separately by each Trust according to their individual preferences.

4.6.2 Wave 2 Contract

The Wave 2 contract was procured solely by NUHT and comprises a Framework Agreement with GE Healthcare Clinical Systems (UK) Ltd for the provision of similar services as Wave 1 to any NHS body in England under a call-off arrangement lasting for four (4) years.

In order to access the Wave 2 Framework NHS bodies will be required to sign an access agreement[5] with NUHT (see Appendix Q). This sets out the terms under which that NHS

[5] Prepared by Browne Jacobson LLP, EMRAD legal advisers

Body may access the Services; levies a charge for granting access to the Framework; provides a copy of the Framework and accompanying information in relation to the call-off arrangements; and limits the liability of NUHT in the event of costs incurred by or breach by the NHS Body concerned.

The remainder of this section focuses on details of the Wave 1 contract between SFHFT and GE Healthcare Clinical Systems (UK) Ltd.

4.6.3 Contract Period

The Wave 1 contract is for an initial period of ten years from commencement of the operational service, with opportunities to extend for a further three years based on performance and delivering continued value for money and then a further two years, if required, to allow smooth transition from the incumbent to a new PACS provider.

Contract Framework and Schedules

The Wave 1 contract framework has been drawn up by the Consortium's appointed legal advisers (Browne and Jacobson) based on standard NHS contract terms and conditions and schedules covering both the supply of and support for the PACS and RIS solutions under a managed services arrangement.

The contract schedules include:

- the provision of additional services, for example, imaging applications for Cardiology, Retinopathy, Endoscopy, and Pathology, should they be required by the Trust;
- the opportunity to obtain a commercial benefit as a result of contributions by the Consortium to the development of Supplier products through a formal partnership arrangement; and
- the opportunity to obtain a commercial benefit as a result of non-EMRAD Trusts Signing up to the Wave 2 contract framework.

Final drafting of the contract schedules will take place following Trust Board approval of this Full Business Case.

4.6.4 Contract Management

The following apply to the draft contract Terms and Conditions and schedules issued to the Bidder at the ITT stage.

4.6.4.1 Change control mechanisms

A formal change control process has been included within the contract schedules and allows for either the Trust/Consortium or Bidder to request, and agree (or not) a change to the functions or performance of the System, the environment in which the System is to be implemented or the tasks which enable implementation of the System. Details of the change required, reason, cost, timescale for implementation, impact of the change and escalation mechanism to arbitrate between Bidder and Trust/Consortium will be included in change control process.

4.6.4.2 Dispute resolution

In the event of the failure to settle any disputes arising out of the Contract the escalation procedure included in Change Control process will initially be invoked, the parties will attempt to settle it by mediation in accordance with the Centre for Effective Dispute Resolution (CEDR) Model Mediation Procedure (the model procedure).

4.6.4.3 Risk mitigation

The contract has been drafted jointly with the Bidder with input from the Consortium Procurement advisor, legal advisors and financial, technical and information specialists to ensure that the Consortium members' interests are fully met and that where appropriate risk sharing is incorporated, a robust service performance regime is agreed and Bidder liability responsibilities.

4.6.4.4 Contract monitoring

It will be the responsibility of the Procurement and Commercial leads advised by the legal advisor to develop the contract schedules to ensure that the new contract terms reflect the services being purchased. The EMRAD Live Services team will be responsible for providing ongoing commercial management of the contract once it has been awarded and throughout the deployment of the new service across the Wave 1 Trusts. The team will provide on-going management of the contract and responsibility for service delivery throughout the remaining life of the contract.

4.6.4.5 Partnership arrangements

There will be mutual benefits from a partnership arrangement, for example by the Consortium Trust members acting as reference sites for the Bidder product and providing opportunities for the Consortium to influence future product development. All Wave 1 EMRAD Trusts also have the opportunity to obtain a commercial benefit as a result of NHS bodies signing up to the Wave 2 contract framework. This will take the form of discounts applied to Wave 1 managed service charges related in value to the number and size, including image volumetrics, of NHS bodies entering the Wave 2 framework. Wave 1 discounts will be applied at the point when a Wave 2 user commences operational use and

The full extent of the partnership arrangements will be formalised as part of the contract clarifications.

4.6.4.6 Exit plan and Termination arrangements

This will be agreed as part of the contract clarifications in line with the standard NHS contract terms and conditions and schedules recognising the additional complexity of having multiple Trusts participating in the contract.

4.6.4.7 Payment mechanism

The payment mechanism has been determined during the procurement dialogue stages and is premised on the payment profile described in the Economic and Financial cases. During deployment milestones will be tied to the acceptance by the Trust of an agreed set of deliverables in accordance with the deployment plan. Service payments will commence after successful operation of PACS and RIS within the Deployment Verification Period (DVP) following go-live.

EMRAD Live Services will review service performance monthly during the operational phase of the contract. Service payments will be subject to the Bidder achieving agreed levels of performance on a month by month basis as measured against the Service Level Agreement (SLA) with the Trust with a provision for service credits to the Trust should the required levels not be achieved by the Bidder.

4.7 Risk Allocation and Transfer

The risks associated with deploying and operating the new PACS/RIS service are set out in detail in Appendix K. The general principle is that risks should be passed to 'the party best able to manage them', subject to value for money. The following table summarises the risks along with the extent to which each is expected to be passed over to the supplier in the proposed contractual arrangements.

	Risk Description	Risk Impact	Mitigation	% Trust retained
A - Design & Development Risks				
A1	Insufficient user consultation regarding requirements	Requirements built into contract schedules do not meet user needs and new requirements emerge once solution is deployed, requiring supplier to charge for new functionality	Ensure extensive consultation with users regarding their requirements	100%
A2	Documented Trust requirements not sufficiently robust - e.g. specification does not accurately reflect user requirements or is vague/unclear	System modifications required once issues with documented requirements emerge, incurring extra supplier charges to change functionality	Extensive quality assurance of requirements documentation by both Trust and supplier staff	100%
A3	Supplier configuration design is inappropriate - for example by not accurately reflecting user and business process requirements or through inappropriate use of system parameters	Extra resources required to rectify supplier configuration and to retrain users once rectified	Extensive user acceptance testing (potentially mitigated in GE case by Extra resources in EMRAD multi-trust multi-expertise team - slack in go-live deadline	100%
A4	Users not sufficiently engaged in project - e.g. regarding overall objectives, selection of preferred supplier, deployment timescales, impact on them during implementation and once service is live	Users do not play their part in the deployment, and subsequent use of the solution resulting in low take-up of solution and reduced benefits	Extensive communication and engagement with users throughout the project Bidder selection processes, deployment timetable, configuration of the solution, adequate training and on-going specialist local resource to ensure best practice use of the solution	100%
B - Deployment Risks				
B1	Image data migration time and/or complexity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	a) Image Data extraction ('data localisation') is accomplished within the agreed exit plan to be performed within the current LSP contract for PACS and b) data migration into the new PACS has relevant contingency/tolerances applied. See ACUO report for data quality assurance	25%
B2	New interfaces (e.g. Peer Vue critical alerts, Active Directory access control for on/off-site access and PIX manager interfaces to Trust MPI's) do not work properly plus interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Dedicated Trust ICT interface development team resource available and access to supplier expertise	80%
B3	Suppliers' deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Possible mitigation by including penalty charge on Supplier contract	50%
B4	Trust's deployment capability and capacity underestimated	Go live date deferred and so current LSP contract	Robust programme planning and management (evidenced	100%

	Risk Description	Risk Impact	Mitigation	% Trust retained
		extended and Trust deployment team retained for longer	by success of EMRAD procurement stage)	
C - Operational Risks				
C1	Supplier's product does not meet Trust functional requirements ready for DVP	Separate functionality has to be implemented and interfaced in order to satisfy missing requirements	Ensure preferred supplier has confirmed it can meet all requirements prior to signing contracts	10%
C2	New legislative or regulatory changes require new functionality that is outside the original requirements	Supplier needs to modify system in order to meet new requirements and charge the Trust accordingly	Compliance stipulated in ISFT and in contract	1%
C3	Supplier's product does not meet Trust performance requirements, causing loss of productivity in the form of reporting backlog and delays to patient pre-imaging processes	Need to hold additional reporting sessions to clear backlog and employ extra temporary staff to manage patient appointments etc and do remedial work to fix the problem	Ensure appropriate service performance levels are set to benchmark system load testing prior to DVP and throughout operational life	30%
C4	Loss of service based on supplier provided / managed component , for example due to data centre(s) failure	Business as usual (BAU) impact (patient care) and need to hold additional reporting sessions to clear backlog and employ extra temporary staff to manage patient appointments etc	Highly replicated system including 2 x Data Centres and failover to local SAP/cache components and service points in contract	50%
D - Termination Risks				
D1	Major commercial problems emerge such as supplier bankruptcy or dispute over contractual responsibilities	Need to negotiate alternative arrangements with supplier or in worst case procure a new supplier	Oblige supplier to notify changes in financial stability and ensure they understand and agree to everything they sign up to. Include within the contract a financial distress schedule giving the Trust remedies should the supplier's financial health fail - software held in Escrow - achieve BAU with new supplier in data centre	40%
D2	Trust seeks early termination (for whatever reason)	Penalty charges for early termination in supplier contract	Robust procurement process that supports Trust long term plans + sign-off at board level and NTDA	40%

Figure 33 – Anticipated Risk Transfer

4.8 Personnel Implications and TUPE

The preferred option is to take PACS and RIS as a managed service from GE Healthcare Clinical Systems (UK) Ltd augmented with support services provided locally by each Trust for Trust located PACS/RIS elements including end user devices and Trust network infrastructure.

There will be no TUPE implications with respect to pursuing this preferred option.

5 Financial Case

5.1 Introduction

This section evaluates the funding requirement for the preferred bidder's solution along with how it will be afforded.

5.2 Affordability Analysis Assumptions

The following assumptions have been made when considering the affordability of this investment:

- The costs include replacement and support of CR modality equipment and workstations, even though these are being procured separately to the PACS/RIS service. Replacing these devices avoids incurring very high maintenance charges that would be incurred if the existing devices were to be retained, and also avoids the risk of the existing devices failing.
- Contingency – a contingency sum is included to meet the costs of risks that materialise. The contingency has been derived from the risk assessment in the Economic Case and amounts to the value of those retained risks that result in extra costs (and so excludes risks that result in reduced/delayed benefits). This amounts to approximately 9% of the base costs presented in the Economic Case.
- Optimism bias – as explained in the Economic Case, no optimism bias uplift has been applied to costs given that all of the optimism bias factors have already been taken into account within the contingency sum that results from the risk assessment.
- Inflation – all figures are shown adjusted for inflation based on composite inflation figures derived using the assumptions within the Trust Long Term Financial Model and provided by the Trust's Finance directorate – namely 2.4% for FY 2014/15 and 15/16, 2.6% for 16/17 and 2.5% thereafter.
- Irrecoverable VAT – as VAT goes to HM Treasury, it has no effect on the Public Sector as a whole and so is not relevant to the economic analysis in the Economic Case. However, from a cash flow point of view the money still needs to be found and so must be included in the affordability assessment for items to which it applies. Following investigation by the Trust's Finance Department, the assumption regarding costs to which VAT applies and whether VAT is recoverable is shown in the following table along with assumptions about which costs can be capitalised.

	Is VAT Applicable?	If so is it recoverable?
PACS /RIS supplier charges		
Core PACS/RIS	Y	Y
PACS Service Charge	Y	Y
PACS Service Charge rebate from Circle for treatment centre	Y	Y
RIS Service Charge	Y	Y
RIS Service Charge rebate from Circle for treatment centre	Y	Y
Supplier Deployment Charge	Y	Y
Image Data extraction ('data localisation')	Y	Y
Image Data import into new PACS	Y	Y
RIS data migration		
Trust deployment costs		
New Client devices test and install	Y	N
Local server elements supply and commission (PACS and RIS)	Y	N
Local SAN elements (PACS and RIS) supply and commission	Y	N
Client devices PACS/RIS software commissioning	N	
Trust Deployment Project Team	N	
End User and Tech support training	N	
EMRAD Prog Mgmt costs	N	

	Is VAT Applicable?	If so is it recoverable?
Modality Engineer costs for on-site modality config	Y	N
Procurement Consortium membership	N	
LSP service charge (up to GE go-live)	Y	Y
Trust infrastructure upgrades to meet WES requirements	Y	N
Trust operational costs		
PACS/RIS application support (Radiology and ICT staff)	N	
PACS/RIS ICT technical support	N	
Medical Physics QA	N	
Client devices PACS/RIS software upgrades	N	
Live Services management	N	
EMRAD Board	N	
CR equipment		
Support of legacy CR equipment	Y	Y
Replacement	Y	N
Support of new CR equipment	Y	N
Support of legacy CR equipment (TC)	Y	N
Replacement (TC)	Y	N
Support of new CR equipment (TC)	Y	N
Diagnostic workstations		
Support of Legacy Diagnostic workstation equipment	Y	N
Replacement of Base Units for diagnostic workstations for DVP	Y	N
Support of new Diagnostic workstation equipment (provided through ICT	Y	N
Replacement of Diagnostic workstations + hi -res screens	Y	N
Support of Legacy Diagnostic workstation equipment (TC)	Y	N
Replacement of Base Units for diagnostic workstations for DVP (TC)	Y	N
Support of new Diagnostic workstation equipment (provided through ICT) (TC)	Y	N
Replacement of Diagnostic workstations + hi -res screens (TC)	Y	N

Figure 34 – Assumed VAT And Capital/Revenue Position

5.3 Funding Requirement

The funding requirement has been calculated by taking the undiscounted costs from the value for money appraisal and then:

- Adding contingency, irrecoverable VAT and inflation.
- For operating expenditure, netting off the value of cash releasing benefits to show the net operating expenditure position and then adding in capital charges to show the net income and expenditure position.

The results are shown in the following tables, first for capital and then for revenue.

Capital summary £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
PACS /RIS supplier charges	0	0	0	0	0	0	0	0	0	0	0	0
Trust deployment costs	0	0	0	0	0	0	0	0	0	0	0	0
Trust operational costs	0	0	0	0	0	0	0	0	0	0	0	0
CR equipment	0	574,968	0	0	0	0	0	0	0	0	0	574,968
Diagnostic workstations	0	0	0	296,615	0	0	0	0	335,593	0	0	632,209
Contingency **	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL	0	574,968	0	296,615	0	0	0	0	335,593	0	0	1,207,177

Includes CR and workstation costs

These figures include optimism bias, include contingency, include inflation and include irrecoverable VAT

* This excludes any impact of VAT

** Comprises the value of Trust retained risk (based on total Trust retained risk) for risks valued financially plus an increase in costs of 0% for scored risks, and excludes any impact of VAT

Figure 35 – Estimated Funding Requirement - Capital

The capital funding requirement over the investment life is £1.207M, comprising the replacement of existing CR modality medical equipment and Diagnostic Workstations. These would need to be replaced regardless of the new PACS/RIS solution.

Operating expenditure summary £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
PACS /RIS supplier charges	0	182,599	320,540	328,874	337,096	345,524	354,162	363,016	372,091	381,393	453,276	3,438,572
Trust deployment costs	39,010	388,759	0	0	0	0	0	0	0	0	0	427,769
Trust operational costs	19,814	74,733	85,599	87,824	90,020	92,271	94,577	96,942	99,365	101,849	121,045	964,039
CR equipment support	0	0	0	0	0	0	0	0	0	0	0	0
Diagnostic workstations support	0	0	0	0	0	0	0	0	0	0	0	0
Contingency **	0	221,532	11,875	11,714	12,007	12,307	12,615	12,930	13,253	13,585	18,836	340,652
Total operating expenditure	58,824	867,623	418,014	428,413	439,123	450,101	461,353	472,887	484,710	496,827	593,157	5,171,032
Operating savings via cash releasing benefits	0	-375,094	-658,565	-675,688	-692,580	-709,895	-727,642	-745,833	-764,479	-783,591	-927,242	-7,060,612
Income from ASR of PACS RIS services	0	0	0	0	0	0	0	0	0	0	0	0
Net operating expenditure position	58,824	492,528	-240,551	-247,276	-253,458	-259,794	-266,289	-272,946	-279,770	-286,764	-334,085	-1,889,580
Capital charges	0	56,554	56,554	92,874	92,874	92,874	92,874	92,874	198,851	198,851	231,993	1,207,177
Net income and expenditure position	58,824	549,083	-183,997	-154,401	-160,583	-166,919	-173,414	-180,072	-80,918	-87,913	-102,092	-682,404

Includes CR and workstation costs

These figures include optimism bias, include contingency, include inflation and include irrecoverable VAT

** Comprises the value of Trust retained risk (based on total Trust retained risk) for risks valued financially plus an increase in costs of 0% for scored risks, and excludes any impact of VAT

Figure 36 – Estimated Funding Requirement - Revenue

With contingency and capital charges included and once the cash releasing savings and income are netted off, the investment will begin to generate a positive margin during financial year 2016/17 and will generate an I&E surplus of £682k over the entire lifetime. However, without additional support or savings there is an I&E shortfall in financial years 2014/15 and 2015/16, which will increase the Trust deficit. This reflects the significant deployment costs that are incurred up front.

The operating expenditure is net of cash releasing benefits of approximately £6m including irrecoverable VAT and inflation. These arise mainly from no longer having to pay supplier maintenance and support charges for the existing LSP PACS/RIS service.

A significant contingency sum is included in financial year 2015/16, the majority of which reflects the risks of problems and delays in deploying the new solution. The contingency value has been calculated using a sophisticated probability-based methodology. Every effort will be made to mitigate and manage risks to avoid these costs being incurred.

5.4 Funding Requirement Comparison With OBC

Not applicable to this FBC as a financial summary was not included with the Outline Business Case

Figure 37 – Estimated Funding Requirement - FBC Vs OBC

5.5 How The Funding Requirement could be Met

Proposals for how the funding requirement could be met are as follows:

- Capital: adding the capital requirements into the future capital programme allocations
- Income & expenditure: the Trust could seek transitional support from commissioners. Without this and without additional savings this business case increases the Trust deficit for financial years 2014/15 and 2015/16 but contributes to the CIP programme from 2016/17.

5.6 Impact On Cashflow, I&E Account And Balance Sheet

The following tables show these positions.

5.6.1 Impact On Cash Flow

The impact on cash flow is as follows:

CASH FLOW SUMMARY £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
CASH OUT												
Capital payments	0	-479,140	0	-247,180	0	0	0	0	-279,661	0	0	-1,005,980
Capital contingency **	0	0	0	0	0	0	0	0	0	0	0	0
Capital payments - total	**0**	**-479,140**	**0**	**-247,180**	**0**	**0**	**0**	**0**	**-279,661**	**0**	**0**	**-1,005,980**
Operating expenditure payments	-58,824	-634,950	-406,139	-416,699	-427,116	-437,794	-448,739	-459,957	-471,456	-483,243	-574,321	-4,819,238
Operating expenditure contingency **	0	-221,532	-11,875	-11,714	-12,007	-12,307	-12,615	-12,930	-13,253	-13,585	-18,836	-340,652
Operating expenditure payments - total	**-58,824**	**-856,482**	**-418,014**	**-428,413**	**-439,123**	**-450,101**	**-461,353**	**-472,887**	**-484,710**	**-496,827**	**-593,157**	**-5,159,891**
VAT	0	-142,183	-61,815	-112,858	-65,008	-66,633	-68,299	-70,006	-127,689	-73,550	-87,413	-875,453
Cash releasing benefits	0	375,094	658,565	675,688	692,580	709,895	727,642	745,833	764,479	783,591	927,242	7,060,612
Total cash out	**-58,824**	**-1,102,710**	**178,736**	**-112,762**	**188,450**	**193,161**	**197,990**	**202,940**	**-127,580**	**213,214**	**246,673**	**19,288**
CASH IN												
Recovered VAT	0	35,214	61,815	63,422	65,008	66,633	68,299	70,006	71,756	73,550	87,413	663,116
Income from ASR of PACS RIS	0	0	0	0	0	0	0	0	0	0	0	0
Total cash in	**0**	**35,214**	**61,815**	**63,422**	**65,008**	**66,633**	**68,299**	**70,006**	**71,756**	**73,550**	**87,413**	**663,116**
NET CASHFLOW												
Net cashflow	**-58,824**	**-1,067,496**	**240,551**	**-49,340**	**253,458**	**259,794**	**266,289**	**272,946**	**-55,824**	**286,764**	**334,085**	**682,404**
Brought forward	**0**	**-58,824**	**-1,126,320**	**-885,769**	**-935,108**	**-681,651**	**-421,857**	**-155,568**	**117,378**	**61,554**	**348,318**	
Carried forward	**-58,824**	**-1,126,320**	**-885,769**	**-935,108**	**-681,651**	**-421,857**	**-155,568**	**117,378**	**61,554**	**348,318**	**682,404**	
Element of payments in 'cash out' that comprises inflation												
Capital	0	-11,230	0	-17,424	0	0	0	0	-49,906	0	0	-78,560
Operating expenditure	0	-20,074	-19,365	-30,200	-40,910	-51,888	-63,141	-74,675	-86,497	-98,615	-126,459	-611,824

Includes CR and workstation costs

These figures include optimism bias, include contingency, include inflation and include irrecoverable VAT

**** Comprises the value of Trust retained risk (based on total Trust retained risk) for risks valued financially plus an increase in costs of 0% for scored risks, and excludes any impact of VAT**

Figure 38 – Impact On Cash Flow

5.6.2 Impact On Income & Expenditure Account

The impact on the income & expenditure account is as follows:

INCOME & EXPENDITURE SUMMARY £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
COSTS												
Operating expenditure payments	-58,824	-856,482	-418,014	-428,413	-439,123	-450,101	-461,353	-472,887	-484,710	-496,827	-593,157	-5,159,891
Non-recoverable VAT on operating expenditure	0	-11,141	0	0	0	0	0	0	0	0	0	-11,141
Depreciation (non-cash flow item)	0	-56,554	-56,554	-92,874	-92,874	-92,874	-92,874	-92,874	-198,851	-198,851	-231,993	-1,207,177
PDC dividend	0	0	0	0	0	0	0	0	0	0	0	0
Grand total costs	**-58,824**	**-924,177**	**-474,568**	**-521,287**	**-531,997**	**-542,975**	**-554,228**	**-565,762**	**-683,561**	**-695,679**	**-825,150**	**-6,378,208**
FUNDING												
Cash releasing benefits	0	375,094	658,565	675,688	692,580	709,895	727,642	745,833	764,479	783,591	927,242	7,060,612
Income from ASR of PACS RIS	0	0	0	0	0	0	0	0	0	0	0	0
Grand total funding	**0**	**375,094**	**658,565**	**675,688**	**692,580**	**709,895**	**727,642**	**745,833**	**764,479**	**783,591**	**927,242**	**7,060,612**
NET IMPACT ON INCOME & EXPENDITURE	**-58,824**	**-549,083**	**183,997**	**154,401**	**160,583**	**166,919**	**173,414**	**180,072**	**80,918**	**87,913**	**102,092**	**682,404**
Closing net book value	**0**	**518,414**	**461,859**	**665,600**	**572,726**	**479,851**	**386,977**	**294,103**	**430,844**	**231,993**	**0**	
Return on assets		**-106%**	**40%**	**23%**	**28%**	**35%**	**45%**	**61%**	**19%**	**38%**		

Includes CR and workstation costs

These figures include optimism bias, include contingency, include inflation and include irrecoverable VAT

Figure 39 – Impact On Income & Expenditure Account

5.6.3 Impact On Balance Sheet

The impact on the balance sheet is as follows:

IMPACT ON BALANCE SHEET £	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25+25/26	Total
Balance brought forward	0	0	518,414	461,859	665,600	572,726	479,851	386,977	294,103	430,844	231,993	
Capital payments	0	479,140	0	247,180	0	0	0	0	279,661	0	0	1,005,980
Non-recoverable VAT on capital payments	0	95,828	0	49,436	0	0	0	0	55,932	0	0	201,196
Depreciation	0	-56,554	-56,554	-92,874	-92,874	-92,874	-92,874	-92,874	-198,851	-198,851	-231,993	-1,207,177
Net book value	0	518,414	461,859	665,600	572,726	479,851	386,977	294,103	430,844	231,993	0	0

Includes CR and workstation costs

These figures include optimism bias, include contingency, include inflation and include irrecoverable VAT

Figure 40 – Impact On Balance Sheet

This assumes that the replacement CR equipment is on the balance sheet and is depreciated on a straight line basis over ten years.

5.7 Trust Underlying/Normalised Financial Position

6 Management Case

6.1 Introduction

This section of the business case describes how the new service will be deployed and subsequently managed in an operational setting.

6.2 Consortium Members and Structure

6.2.1 EMRAD Members

The East Midlands PACS Consortium consists of the following Trusts:

- Chesterfield Royal Hospital NHS Foundation Trust
- Kettering General Hospital NHS Foundation Trust
- Northampton General Hospital NHS Trust
- Nottingham University Hospitals NHS Trust
- Sherwood Forest Hospitals NHS Foundation Trust
- United Lincolnshire Hospitals NHS Trust
- University Hospitals of Leicester

EMRAD is hosted by Nottingham University Hospitals NHS Trust. The hosting arrangement is an administrative necessity and does not infer ownership or risk transfer to the host.

EMRAD members will have direct contractual relationships with the Supplier and not directly with EMRAD, that is, Trust-specific Wave 1 contracts will be agreed by each Trust with the Supplier.

6.2.2 Programme and Project Teams

From feedback during the procurement exercise, it became apparent that there would be significant advantage in having a ‘management function’ to support all Consortium members to deploy the new solutions and to manage the live services environment. Through discussions with the supplier, it became apparent they too would be able to reduce their costs across the consortium by working in this way. This has informed the programme and project management governance arrangements going forward into the implementation and operational stages of this investment.

6.2.3 EMRAD Board

EMRAD will establish a Board comprising representatives from each organisation in the Consortium and from the EMRAD Live Services Team. This Board will be the driving force behind the solution provided and will use its collective influence with the supplier and externally to ensure effective implementation at the beginning of the contract and continual improvement of the service over the lifetime of the contract. We expect the senior members of the Live Services Team to be in place before deployment in order to lead the programme at the initiation and planning stages and underwrite the decisions taken at both contract and deployment stages.

6.2.4 EMRAD Live Services Team

The Live Services team is expected to comprise a Service Director supported by a Service Executive, Technical Lead, a Medical Director and 7 EMRAD Account Managers, one from each Trust, who will have specific specialist roles including adoption of new products/software releases, and ensuring the quality of on-going training. The Account Managers will come into place as Trusts transition into their live service.

The EMRAD 'Live Services' Team will provide continuing support to Trusts in the Consortium to ensure the solution works effectively and as expected. Specifically, the Live Services Team will:

- Be the link and continuity between the Procurement phase, the deployment phase and the live phase to ensure what we set out to achieve is achieved.
- Work with the consortium members to ensure the product runs as expected and that the benefits are exploited to the full potential across all sites.
- Work closely with the Local PACS/ICT teams to ensure they are supported fully.
- Support the Trusts dealings with the supplier in terms of performance issues.
- Support the Trusts dealings with the supplier in terms of additional functionality they may wish to procure under the terms of the contract to ensure best value.
- Support the deployment of new releases and new products under the terms of the contract.
- Support the local PACS teams with practical issues such as training and support.
- Co-ordinate and manage cross-consortium learning and sharing events to ensure all Trusts in EMRAD can learn from each other and help shape the future requirements of the service.
- Be a single voice to influence the supplier going forward.
- Be responsible for encouraging Wave 2 Trusts to join the Consortium to ensure that all Wave 1 organisations get the benefit of the negotiated discounted rate to full advantage.

It is important to note that the supplier costs have reduced significantly on the proviso that the Live Services team acts as a single negotiating body for the Consortium members and ensures a co-ordinated approach to both deployments and service upgrades over the lifetime of the contract. The responsibilities of the Board and Live Services teams are described in Appendix R.

6.2.5 Deployment of PACS and RIS

The Senior members of the EMRAD Board and Live Services will be supplemented throughout the deployment programme, expected to take approximately 18 months, by a whole time Deployment Manager; Workstream leads for ICT, PACS administration and training and a Clinical Lead (Non-Radiology, 2 PA per week). They will also be supported by an additional core deployment team of 7 whole time equivalent staff, one from each Trust, who will support the deployment at a particular site and contribute to the Trust's local project team as the bulk of deployment activity takes place at each site. Specifically, the Deployment Team will:

- Be responsible for co-ordinating the deployment activity across the Wave 1 Trusts through close working with the Local deployment teams.
- Manage the deployment in line with MSP and PRINCE 2 programme and project methodologies
- Work closely with the Local Deployment Teams to ensure the deployment is fit for purpose for each Trust.
- Supplement and support the local deployment team at the peak of go-live activity.
- Provide a 'learned' and experienced team of deployment specialists who are EMRAD based but have a detailed knowledge of the product and how it is expected to work going forward.
- Be the liaison point between the Trusts and the Supplier.

6.2.6 High Level Programme Management

Figure 41 shows the proposed high level structure and teams to deliver PACS and RIS across the EMRAD Trusts.

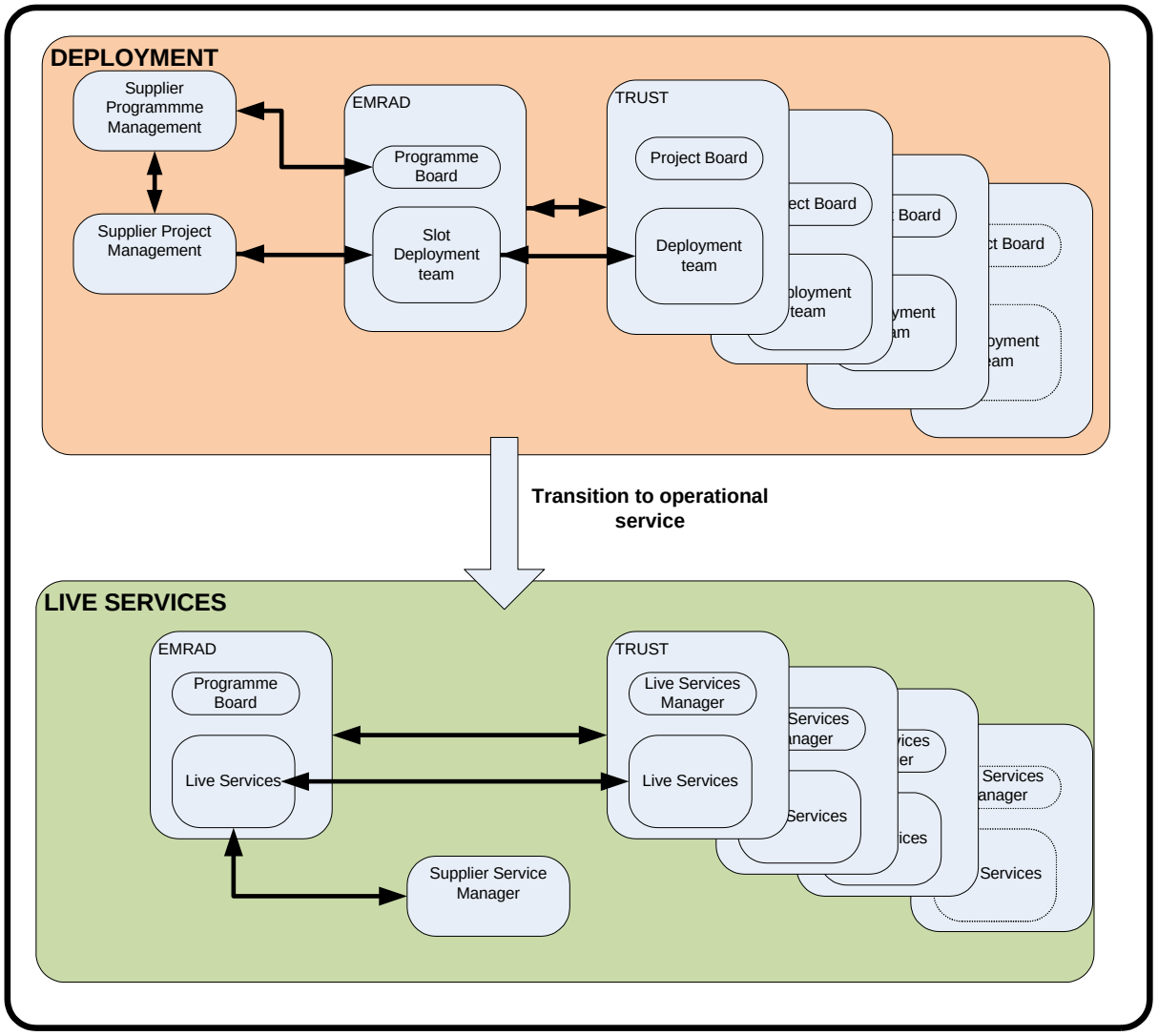


Figure 41 – EMRAD and Trust Programme and Project Structure

6.2.7 Programme Scope (EMRAD Deployment)

The scope of the programme will include the deployment of the new PACS and RIS service into each of the EMRAD Trusts in line with a 'slot plan' jointly developed by the Supplier and Trust project deployment teams and approved by the EMRAD Board. The high-level timeline is shown in Figure 42.

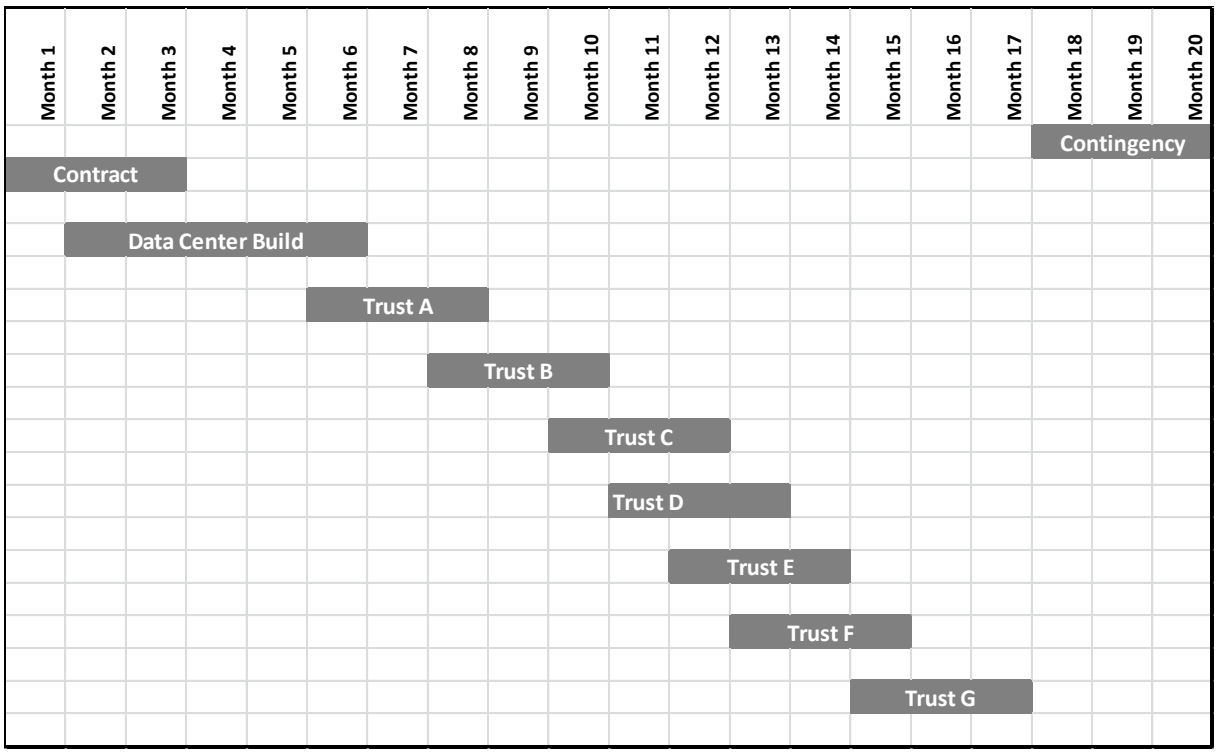


Figure 42 – Slot Plan

6.2.8 Resourcing the EMRAD and Trust Deployment Teams

The costs of the EMRAD and Trust teams have been included in the Economic and Financial cases.

6.2.9 Project Scope (SFHFT Deployment)

The aim of the deployment project at each Trust is to deploy the new PACS and RIS service with commercial 'off the shelf' products, PACS and RIS, to replace those provided under the existing LSP managed service and will need to recognise the necessity of working within the constraints imposed by EMRAD partners. The main project aims are:

- configuration of the new products in line with both the Trust's specific requirements, overarching EMRAD requirements and National requirements;
- migration of essential legacy data from the SFHFT localised image archive and from the existing RIS;
- rationalisation of reference data across EMRAD Trusts;
- interfacing of PACS and RIS to the existing IT and imaging estate;
- interfacing to the existing imaging modality estate and diagnostic quality workstations;
- deployment of PACS and RIS services across all SFHFT sites;
- training end users and technical support teams;
- identifying and establishing new ways of working to best exploit the RIS/PACS solution capabilities;

Key criteria which characterise this project are:

- Multiple external dependencies involving EMRAD partner Trusts and other healthcare agencies in our Local Health Community;
- Business change to the processes in and around the enhanced ability to share images and reports across EMRAD for example, across all clinical directorates and some corporate services;
- The need to make best use of scarce resources and skills which will require the project to establish clear priorities with a focus on providing the equivalent or better management of the delivery of radiology services in the immediate term.

Further details regarding key Trust roles are set out in Appendix S.

6.3 Project Management Structure And Methodology

The project will be managed using the PRINCE2 methodology. The NUHT project team structure is shown below.

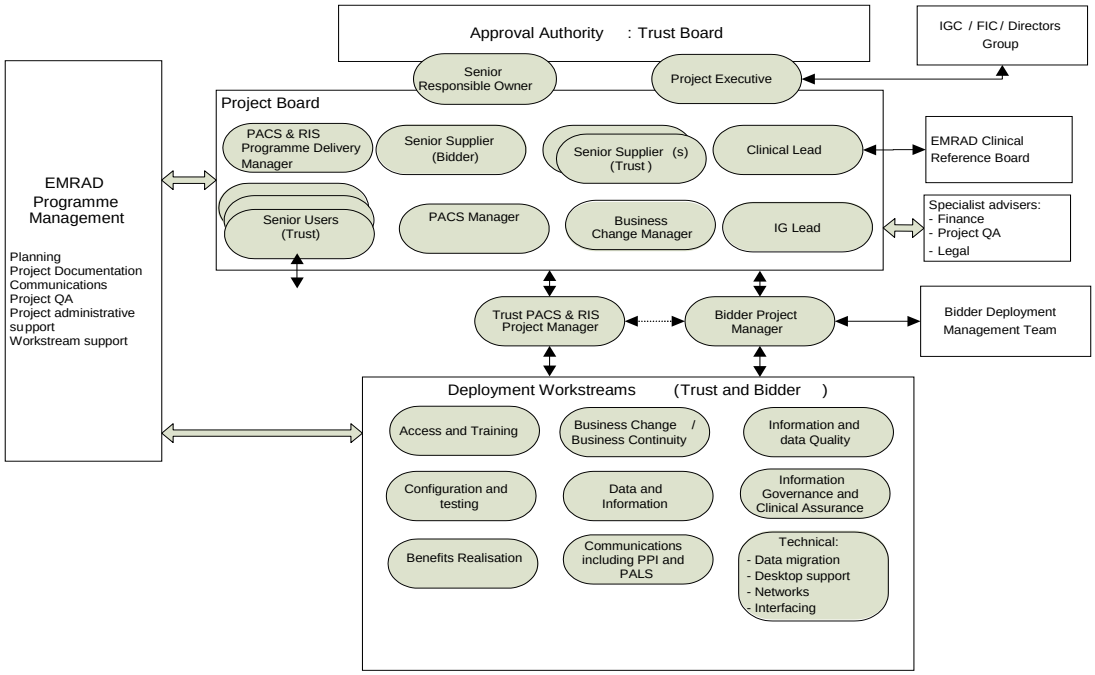


Figure 43 – Project Team Structure

6.3.1 Governance Procedures

A robust governance arrangement will be in place prior to commencing PACS and RIS deployment to confirm the roles of the EMRAD Board, local Trust project teams and Bidder teams in relation to the assurance and authorisation of the deployment activities. These will be detailed in the Project brief, Project Initiation Document and plan as part of the initial planning phase.

Trust and Bidder readiness will be assessed through a series of formal Organisational Readiness Assessments (ORA) jointly held with the Bidder and the Trust and a work-off plan agreed to address any issues that are identified in parallel with the development of the project brief. This process will ensure that the project is defined appropriately and that the Trust is ready to embark upon project activities to proceed with the project.

The project will be delivered through a number of key stages and Project Board approval will be sought for the commencement of each of the main project stages and acceptance of their completion.

6.3.2 PACS Deployment Plan

The high level plan in Figure 44 shows the overall project deployment cycle covering Organisational Readiness Assessment and Management of stage boundaries which include:

- Pre-Contract; Initiation;
- Design and Build;
- Preparation for Go-live including a dress rehearsal;
- Go-live; and
- Deployment Verification Period.

Stage / Milestones	Pre-Contract	Initiation	Design, Build and Test not including User Acceptance Testing			Preparation for Go-Live		Go-Live	DVP (42 days)	Operational
Month	0	Mar-15	Apr-15	May-15	Jun-15	Jul-15		Aug-15	Sep-15	12+
Governance		Setup governance/Project Approved				Design, Build and Test approved		Go-live approved		DVP approved
Project Management		Project Initiation & Operational Readiness	Design, Build and Test			Preparation for Go-Live	Dress rehearsal	Go live	Deployment verification	
Functional & Configuration		Gather Requirements	Configuration and Initial Build			Update and maintain configuration		Configuration updates		
Business Change	Current position	Change approach	Future state mapping		Business change	Business change		Business change		
Benefits Realisation	Define benefits	Benefits Realisation planning	Benefits realisation operational assignment			Operational planning		Benefits realisation		
Data Migration	Data cleansing	Data cleansing	Data cleansing, corrections, transform and load			Load iterations, sign off		Final load	Operational cleanse	
System Integration		Specification	Interface design, including Trust Interface Engine			Interface testing and rework				
Testing		Test strategy	Test planning, test scripts and preparation			UAT prep	User Acceptance Tesing	Go-live testing		
Reporting		Define Requirements	Data warehouse and reporting design and build			Testing and rework				
Training		Strategy	Requirements	Train the Trainer	Schedule users	Schedule	User Training	User training		New users
Technical & Infrastructure		Strategy	Work with supplier re: configuration/data centre DR testing		Peripheral setup	Test Live Environment	Infrastructure test			

Figure 44 – Trust Deployment Plan

6.4 Training

6.4.1 Responsibility for Training Delivery

The lead responsibility for co-ordination of Trusts trainers and for' End User' training will be assumed by the Training Lead/Manager who will report into the Trusts Senior Project Manager responsible for the PACS/RIS Replacement project. Training preparation will begin at least 2 months before the start of actual end user training delivery, to allow detailed logistical planning, training environments and training materials to be finalised and undertaken jointly by Trust representatives and Application Specialist Supplier staff. End user training is intended to be delivered to users commencing 6 weeks before the shared RIS and PACS go live and formal training facilities will continue to be available post go-live to address any refresh training requirements. This is the optimum training 'window' based on previous experience of end user training for large system deployments.

Figure 45 shows the headcount and roles of staff who will require training. Data is directly sourced from the Trusts Electronic Staff Record (ESR) database.

Staff Role	Targeted training (Group 1)	Full Training (Group 2)
Training target pre go-live	80%	100%
Consultant		10
Manager		1
Radiographer - Diagnostic	40	15
Radiographer - Diagnostic, Manager	2	
Grand Total	**42**	**26**

Figure 45 – PACS and RIS End User Staff Training Headcount

The focus of PACS training will be on Consultant Radiologists and PACS managers, a total of approximately 26 staff. In addition a further 42 staff mainly comprising radiographers will receive targeted training, for example, searching/retrieval and viewing of images. The training targets will be to achieve 100% for staff in Group 2 roles and a minimum of 80% for staff in Group 1 roles by go-live to mitigate clinical risk and dip in productivity and to ensure a smooth transition to the new PACS and RIS live services.

An 8 week post go-live period will be used to address the remaining shortfall in un-trained clinical and non-clinical staff.

6.4.2 Training Environment

The Training environment will be situated in the Suppliers Data Centre and provide trainees with the same functionality as the EMRAD live environment. This environment is particularly important during the implementation phase as it will be widely used to train users across SFHFT and EMRAD.

6.4.3 Training Approach

The approach to training will combine one to one training for Radiologists with "train the trainer", cascade training and online training for other members of staff. Specific features of training include:

- Focus on training staff with responsibility for clinical reporting before go live;
- Combinations of one to one and cascade training where appropriate;

- Registrars, Reporting Radiographers, and Reporting Sonographers trained in groups of no more than 3;
- Training will be on site within a Trust;
- Follow-up training post go-live
- High risk areas and Trusts with multiple sites will receive additional support;
- Comprehensive Training documentation both electronic and hard copy format and on line customisable to each Trust's requirements;
- Additional Training for Radiation Dose Monitoring and Voice Recognition and web based reporting applications;
- Additional training staff to supplement the existing ICT training

6.5 Supporting the Operational Service

Exploitation of the increased functionality of the new PACS

The exploitation of the new functionality this system will bring will be investigated during the implementation phase of the project.

6.6 Security and Confidentiality

The security and confidentiality of patient data from contract finalisation to the design, implementation and operational stages of the project will be scrutinised by the Information Governance and IT Security advisor who is a member of the Trust deployment team and include:

- User access to the service including Role Based Access Control (RBAC)
- Audit services
- Data sharing agreement;
- Privacy Impact Assessment;
- Access to Patient Identifiable Data (PID) by the Supplier and sub-contractors;
- Movement of PID into and out of the service.

6.7 Benefits Management

During the development of this FBC, a set of benefits associated with operating the new PACS and RIS was generated, as presented in Appendix F. They were derived and validated through extensive discussions with representatives from NUHT Radiology department and ICT and validated by relevant SFHFT staff. The process determined the nature and value of the benefits, the timescales for realisation and the dependencies on which benefits relied.

The outcomes were used to feed into the value for money analysis presented in the Economic Case and so are not repeated here.

A Benefits Realisation Plan will be developed based on outputs from the benefits analysis activities taking into consideration the benefits type, ownership, value, timeline, the necessary initial base-line studies required and the evaluation metrics.

6.8 Risk Management

The approach to Risk Management to be used throughout this project is informed by PRINCE2. The risks associated with the design, deployment and operation of the new solution and their management are detailed in Appendix K. These risks will be assessed prior to and throughout the project delivery and operational cycles and managed by the Trust

project team with an escalation path through the Senior Project Manager to the EMRAD Project Board and SRO.

6.9 Contingency Arrangements

The PRINCE2 methodology allows for off specification management and this will be followed if this becomes necessary.

The quantified risk assessment in Appendix K includes details of a contingency sum that has been calculated from a combination of the financial impact of each risk, the probability of the risk occurring and the extent to which the risk is retained by the Trust (rather than passed to the supplier). The resulting contingency values per year are included as a discrete cost line in the Financial Case funding requirement.

6.10 Project Evaluation

The project will continue to be reviewed regularly by the Trust project team and EMRAD Board for a minimum period of twelve months post go-live to:

- monitor the delivery of service redesign and benefits realisation;
- objectively assess the effectiveness of the PAS operating, training and test environments and the support arrangements.

In addition there will be a Post Implementation Review after go-live, at a date to be determined by the Project Board, as part of the formal Project Closure stage in order to:

- Ascertain the extent to which the project met its objectives, delivered planned levels of benefit, avoided or dealt with risks and addressed the specific requirements as originally defined;
- Examine the efficacy of all elements of the working business solution to see if further improvements can be made to optimise the benefit delivered;
- Identify any unexpected problems caused by the use of the new PACS and RIS;
- Identify any unexpected benefits, and
- Confirm that the new PACS and RIS have actually allowed the Trust to avoid additional expenditure as identified in the Future Avoided Costs benefits category.

6.10.1 Success Criteria

Overall success of the PACS & RIS deployment will be measured against the achievement of the milestone points indicated in the high level deployment plan and associated acceptance criteria.

6.11 Advisors

The following specialist advisors have been involved in devising this business case:

- Phil Beale, business case expert.
- Steve Frampton, HSCIC, PACS Programme QA Adviser.
- Allison Rigby, NUHT Project Accountant, Finance.
- Neil Morton, NUHT Finance, Specialist VAT adviser.
- Rachel Wing, Tony Kamillo NUHT Finance and Procurement.
- Browne and Jacobson, Trust Legal advisors.

Appendix A National Drivers

The Trust has a clear ongoing obligation to manage the capture, storage and dissemination of radiological images and reports in a systematic and safe manner. On top of this it must be capable of responding effectively to the following national policies and themes that have a specific consequence for handling and sharing radiological information:

- Department of Health Information Strategy: The power of Information:
    - Emphasis on recording Information (including diagnostic images and reports) once, at our first contact with professional staff,
    - Shared securely between those providing our care
    - Consistent use of information standards that enable data to flow (interoperability) between systems
    - Keeping confidential information safe and secure and respecting patient confidentiality; and
    - Shared safely across boundaries and settings.[6]
- Guidelines and Standards for implementation of new PACS/RIS solutions in the UK – Royal College of Radiologists (RCR), 2011 and National Strategy for Radiology Image and Report Sharing – RCR 2009
    - The current use of information and IT, though excellent in parts, for example PACS ,is too variable and disjointed to enable the integrated, high quality care we all want to see;
    - The principal driver for changes in the way … image and report sharing and image storage is delivered will be cost …;
    - All healthcare organisations in England will have to take on responsibility and ownership of PACS post LSP;
    - The need to adhere to national and international standards to support interoperability … for data sharing between organisations … and the ability to monitor patient d doses and compare them with national standards;
    - Expectation of patients and clinicians that having access to the entire imaging history at the point of clinical care ,including hospital, GP and home reporting locations, improves clinical management and quality, safety and efficiency of patient care and of Radiologists the recognition that such access improves reporting accuracy;

[6] Liberating the NHS: An Information Revolution

- Current practices for image and report sharing using DICOM push - via the Image Exchange Portal (IEP) - physical and CD transfer duplicate images, require significant manual intervention/support, are associated with patient safety issues as well as clinical data protection and medico-legal risk. They are inefficient and expensive compared with the efficiency, effectiveness and cost of data sharing using recent and emerging technologies that allow automation of information sharing;

- Cancer/cardiac/stroke services depend on formal networks for their delivery and hence clear and auditable lines of responsibility with regard to inter-hospital referral need to be supported which requires a seamless automated process for image and report sharing between all sites in the network

- Standards for the provision of tele-radiology within the UK – RCR 2010

  - The future of diagnostic imaging service provision is increasingly likely to involve the use of data sharing across organisations and some splitting of the image acquisition process from the reporting function within and outside the UK. Establishment of standards (technical and process) is imperative in order to maintain high-quality and safe patient care especially when such services are being provided in a more competitive commercial environment. Attention to standards will ensure the sustainability of local diagnostic imaging services and maintain high standards of patient reporting, ensuring patient safety and confidentiality.

- Retention and Storage of Images and Radiological Patient Data - guidance provided by the Royal College has significant implications for the storage and life cycle management, that is, the capture, storage, use and destruction, of images and associated information:

  - NHS Code of Practice for records management RMCoP [advises that] retention of image and associated requests and reports should all be retained for the same duration;

  - Image storage will require differential storage periods and be governed by triggers from other patient information systems in line with relevant patient event history and the current workaround is to retain for longer periods and compress the data appropriately

  - Secure record destruction in the face of persistence and duplication of image data

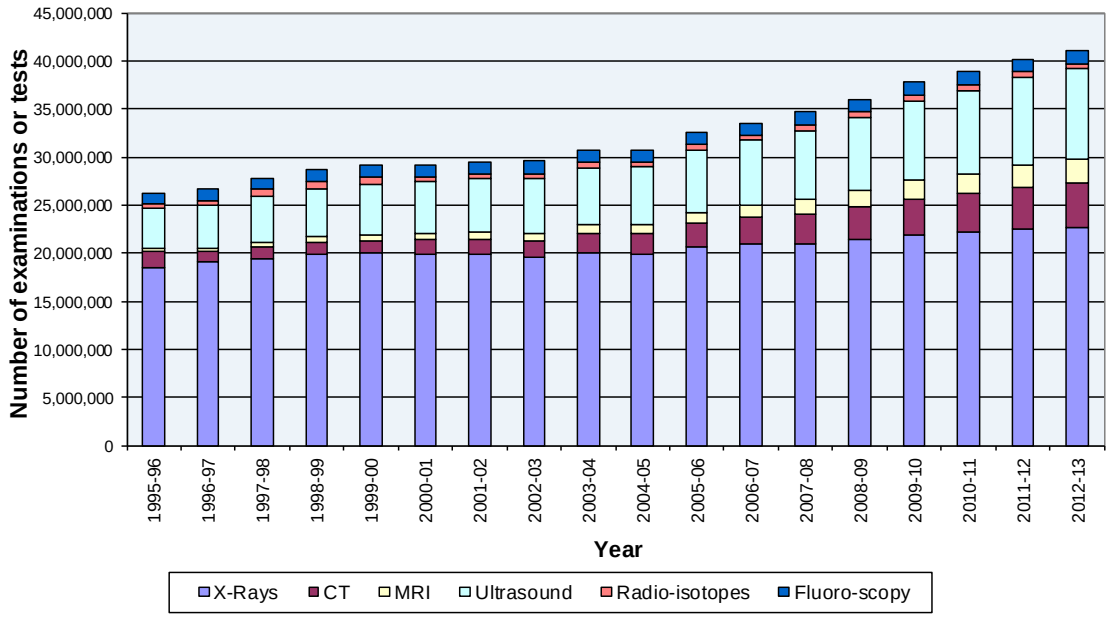
  - The need to comply with data security and access in as stipulated in the Data Protection and Freedom of Information Acts and British Standards Institute (BSI) Legal Admissibility standards

  - The recommendation to comply with published retention schedules and with National Information Governance (IG) guidance and, if used as medico-legal evidence, with appropriate British Standards

Appendix B Imaging Activity Levels

Growth in imaging activity in England 1995 – 2012 showing the trend since publication began in 1995-96.

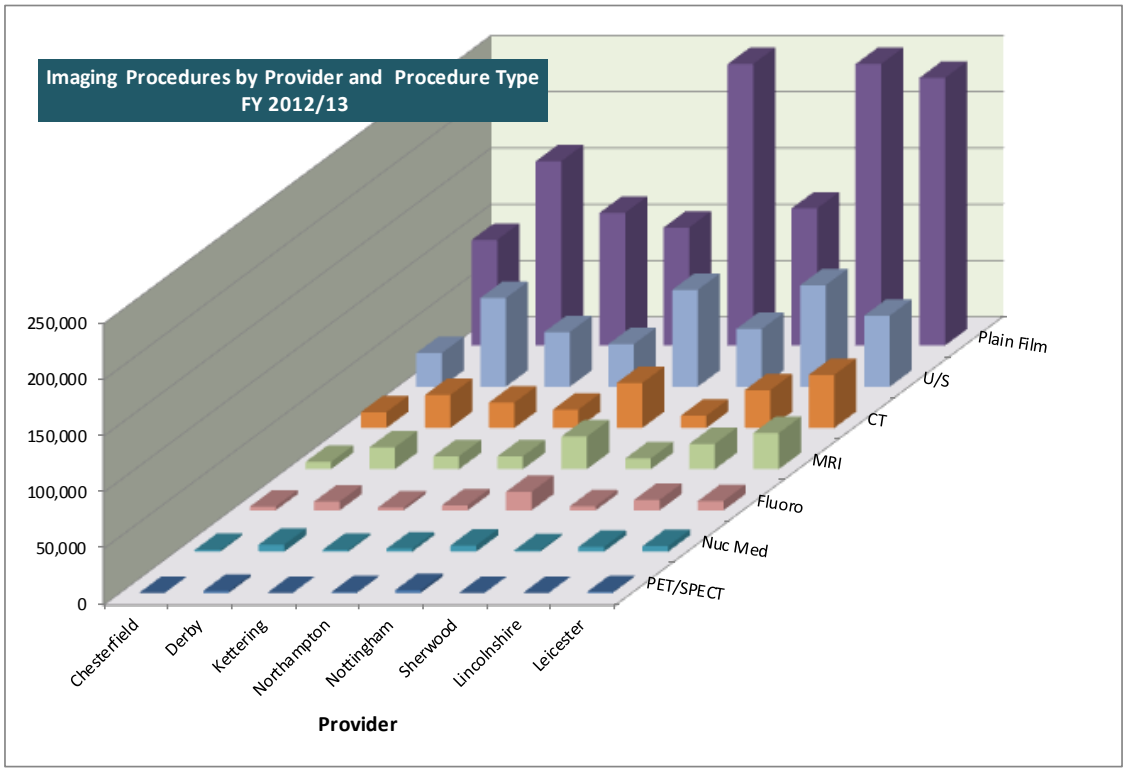
Total number of imaging and radiodiagnostic examinations or tests, by imaging modality, England, 1995-96 to 2012-13



Main Findings Nationally:

- The total number of imaging examinations or tests, covering the period from 1st April 2012 to 31st March 2013 was 41.1 million, compared to 40.2 million imaging examinations or tests in the period from 1st April 2011 to 31st March 2012. ***This represents an increase of 2.2%.***
- Of these imaging examinations or tests, 22.6 million were X-Rays (radiographs), 9.3 million were Ultrasound, 4.7 million were Computed Tomography (CT), 2.4 million were Magnetic Resonance Imaging (MRI), 1.3 million were Fluoroscopy and 0.6 million were Radio-isotopes.
- The tests showing the ***highest growth over the past year are CT (7.9%) and MRI (6.5%)***
- Over the last 10 years, the overall number of tests has increased by 39%, representing ***an average growth of 3.3% per year.***
- ***The volume of MRI scans has increased by 211%, and the number of CT scans by 167% over this 10 year period***. These represent average growths per year of 12.0% and 10.3% respectively. This reflects both the increasing availability of these tests over recent years and the aim for earlier diagnosis of conditions such as cancer.

EMRAD Imaging Activity by provider and imaging procedure type



Definitions of Imaging Procedure

(Source - Diagnostic Imaging Dataset Statistical Release Provisional monthly experimental statistics)

Computerised Axial Tomography (CT Scan)

Computed tomography (CT), sometimes called CAT scan, uses special x-ray equipment to obtain image data from different angles around the body, then uses computer processing of the information to show a cross-section of body tissues and organs. In the DID this means all codes mentioning CAT or computed tomography.

Diagnostic Ultrasonography (Ultrasound)

The use of ultrasonic waves for diagnostic or therapeutic purposes, specifically to image an internal body structure, monitor a developing foetus, or generate localised deep heat to the tissues. In the DID this means any code relating to ultrasound.

Fluoroscopy

Fluoroscopy is an imaging technique commonly used by physicians to obtain real-time images of the internal structures of a patient through the use of a fluoroscope. In its simplest form, a fluoroscope consists of an x-ray source and fluorescent screen between which a patient is placed. In the DID this is a collection of codes mentioning fluoroscopy or using fluoroscopic guidance, Barium enema or swallow. Interventional procedures are classified under imaging modalities which provide guidance. Almost all interventional procedures are under fluoroscopy procedure. A very small number of interventional procedures are under CT or MRI procedures.

Magnetic Resonance Imaging (MRI)

Magnetic resonance imaging (MRI) is a method of producing extremely detailed pictures of body tissues and organs without the need for x-rays. The electromagnetic energy that is released when exposing a patient to radio waves in a strong magnetic field is measured and analysed by a computer, which forms two- or three-dimensional images that may be viewed on a TV monitor. In the DID this means all codes mentioning MRI.

Plain Radiography (X-ray)

A Radiograph is an image produced on a radiosensitive surface, such as a detector, by radiation other than visible light, especially by x-rays passed through an object or by photographing a fluoroscopic image. In the DID this means any code referring to radiography or X-ray.

Medical Photography

A Photograph is an image recorded on sensitized material by energy from the light spectrum, which is then processed to create a print that can be viewed clearly. Medical Photography is used in order to document a variety of different medical conditions and their treatment.

Nuclear Medicine

Nuclear medicine (NM) is a branch of medicine and medical imaging that uses unsealed radioactive substances in diagnosis and therapy. These substances consist of radionuclides, or pharmaceuticals that have been labelled with radionuclides (radiopharmaceuticals). In diagnosis, radioactive substances are administered to patients and the radiation emitted is measured.

Nuclear medicine imaging tests differ from most other imaging modalities in that the tests primarily show the physiological function of the system being investigated, as opposed to the anatomy. It has both diagnostic and therapeutic uses, such as planning cancer treatments and evaluating how well a patient has responded to a treatment. It can be used with other diagnostic methods, including CT scans and MRI, where the images are superimposed to produce complex cross-sectional, three-dimensional scans.

Appendix C Improvements to Clinical Services at SFHFT & Wave 1 Trusts

Clinical 'quick wins' that an integrated radiology system would enable at SFH, today, with the minimum of associated workforce transformation:

- Regional clinical care multidisciplinary meetings (MDTs);
- Major Trauma Network;
- Regional Stroke / out-of-hours services; and
- Patient transfers

Status Quo "As is"	Current Issues	Where we want to be	Potential Future Cost Avoidance
Regional cancer / clinical care multidisciplinary meetings: ***To enhance cancer care pathways across the East Midlands region***			
In line with national guidance, the management of all patients with known malignancy is discussed at multidisciplinary care meetings (MDTs). At the current time many of these meetings are conducted in a cross region fashion, utilising existing ICT infrastructure based round video conference systems, which were upgraded in 2011 and connected to the N3 NHS Information System. However, the significant limitations of multiple separate radiology imaging systems could not be easily overcome at that time. ***The issues and opportunities described here are applicable to other MDTs conducted for a number of clinical specialties, including: oncology, hepatobiliary and neurology.***	Currently, access to radiological imaging which is critical for safe patient management, is limited to either a low quality image review over a video conferencing link, using a low level image transfer protocol between Trusts (or the use of IEP as an image (not report) transfer tool which takes several hours), or is reliant on individual clinicians having access to a hospital's radiology systems. For regional MDTs this may require individual access to four or five separate Trust systems. This is an unsafe system, and in several cases has led to a documented delay in patient management due to inability of treating clinicians to appropriately review images from a patient based in another regional centre. Concerns regarding insufficiency of current radiology IT arrangements cross-region, have been reported by recent Peer Reviews (for example, Neuro-oncology Peer Review). In addition, access to radiology reports is not currently available using the first two of the current access systems and therefore clinical opinions cannot be shared effectively. Any	Use across EMRAD of a common radiology system that allows: • immediate and seamless access to and comparison of patient images regardless of the geographical site of acquisition • radiology reports to be modified in real-time in line with shared clinical opinions; and • any disagreements, errors or changes to radiological interpretation to be recorded on the 'source' system.	Potential scenario: Images cannot be viewed at the MDT so the patient case is deferred to following weeks MDT. This may happen more than once. The long delay may result in a tumour now being inoperable and incurring drug therapy treatment costs circa £12K per year. The above is an example of cost avoidance and is not a cost already being incurred by the Trust. If the patient breaches the waiting time target there could be financial penalties for the Trust - £200 in respect of each excess breach above that threshold.

Status Quo "As is"	Current Issues	Where we want to be	Potential Future Cost Avoidance
	disagreements, errors or changes to radiological interpretation cannot be recorded on the 'source' system.		
Major Trauma Network: T***o enhance and increase the stability of the East Midlands Major Trauma Network patient transfer system***			
NUHT is the Major Trauma Centre for the East Midlands. At present, any severely injured patient will either be brought directly to NUH, or may be taken to one of the regional hospitals for stabilisation/urgent imaging assessment and then transferred to NUH. Immediate access to imaging investigations AND reports performed in the regional hospitals, is crucial for the Major Trauma Centre, in order that prompt assessment of injury, assessment re; stability for transfer, and/or planning for urgent surgical management can be carried out.	The current system of regional image transfer uses a low level image transfer protocol (IEP) to move images from one hospital to another; this process is dependent on trained staff at the sending hospital, is not instantaneous, and importantly does NOT send the radiology report with the images. This often leads to delays in management of severely injured patients when transferred, and in some cases has necessitated complete repeat of imaging studies with attendant increase in radiation exposure and delay to patient management	Enhancement and increased stability of the East Midlands Major Trauma Network transfer system through the use of a regional radiology system by all trusts within the network allowing: • severely injured patients to be imaged at receiving trauma centres as part of their initial clinical stabilisation; • immediate provision at that point of images and reports for review by the Major Trauma Centre in Nottingham; or alternatively • potentially reported at the Major Trauma Centre directly; and hence • prompt and appropriate clinical decision making regarding the onward patient transfer, planning for theatre and/or other intervention, while the patient is still at the receiving trauma centre.	Potential Trauma Scenario: Patient from Lincoln with previous history of brain surgery, presents unconscious at NUH. CT shows hydrocephalus but not sure if this is acute or not. Neurosurgeon unable to view previous images and waits 3 hours for taxi to bring CD. During this time the patient condition deteriorates and even despite prompt surgery they are left with lasting neurological damage with ongoing care costs The examples given are worst case scenarios and would be future costs that can be avoided. They are not costs currently being incurred.
Regional Stroke / out-of-hours services: ***To remove any limitations on the existing services***			
Patients who are admitted to SFHFT or other regional hospitals with a suspected stroke have an urgent CT scan as part of their initial workup. A decision regarding administration of an IV thrombolysis drug to break down any potential clot, is made following a review of the CT scan, and this review is performed by a consultant Stroke physician as the drugs have significant adverse side effects.	At present, if the consultant is off-site at the time of scanning, the imaging can only be reviewed using the low-level image transfer package (IEP), which has the same limitations as described above. It also requires access to radiology imaging using a laptop, and SFHFT does not currently have a mature and reliable solution for image review on remote systems. A previous software package is now no longer supported by the manufacturers and has been withdrawn. In addition, NUHT Stroke services are working with Sherwood Forest Hospitals (SFH) clinicians to provide a more regional	An enhanced regional stroke service and improved out-of-hours reporting service through the use of a regional radiology system that would completely remove limitations on the existing service by; • offering clinicians access to a fully functioning radiology system regardless of their physical location within the EMRAD; • using new but stable technologies to significantly improve remote access to imaging;	Potential Stroke scenario: Stroke patient received out of hours at an outlying Trust and a CT scan is done immediately to determine the type of stroke. There is no Stroke Physician in the Trust. Timing is crucial for thrombolisation of the patient to prevent lasting damage from the stroke. If drugs are not given then the long term care of patient is the cost. EMRAD would enable one Stroke Physician to be on call for the entire region who can access images from wherever he is including

Status Quo "As is"	Current Issues	Where we want to be	Potential Future Cost Avoidance
Similar issues and opportunities with regard to out-of-hours support apply to Spinal, Neurosurgery, and Paediatric services.	review service; again, this is wholly dependent on access to imaging from SFH.	• facilitating real-time clinical consultation between stroke physicians and radiologists; and • significantly improve the ability of NUHT consultant radiologists to review complex cases and support junior radiological staff during busy periods of out-of-hours work.	from home. Saving against on call rotas Saving on travel / on call costs
Patient Transfers: ***To improve the support for patient movement around the EMRAD region and across EMRAD borders***			
Clinicians within the EMRAD domain have limited access to images and associated reports in order to provide continuity of patient care.	Provision for transfer and display of patient images and reports beyond the boundaries of a single NHS Trust requires extensive use of IEP and CDs; reports cannot be reliably transmitted between IT systems.	• reduction/removal of the use of IEP or CDs needed to provide continuity of patient care (and support medico-legal requirements); • provision of patient images and reports to any appropriate remote workstation; • follow-up clinics held in a smaller local hospital closer to a patient population- or perhaps as a joint primary care venture; and • clinicians working in follow-up clinics having access to all relevant radiology information as if they were physically present in their base hospital.	Outsourcing reporting to private companies: currently all or most Trusts in the region are forced to outsource some of the reporting work to Medica / 4Ways or other external private companies. In 2013/14 NUHT outsourcing spend was £264k – it will be similar at all other Trusts. With EMRAD that work could be done by medical staff across the region at a cheaper cost to the NHS. This is dependent on their being a sufficient medical reporting resource in the region. Without this outsourcing will still be necessary.

Appendix D Sources Of Costs

The following table sets out the sources of the costs associated with the proposed investment.

Accenture Invoice	
HSS Invoice	
CR Quote	
Diagnostic Workstation quote	
Hi-Resolution Screens quotes	

Appendix E Costs

The following table sets out the costs associated with the proposed investment. For more information please see the Excel business case model available under separate cover. All financial values are in £.

Costs - FBC position (all costs £ exc VAT)	Cost explanation	(C)ap/ (R)ev	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total
PACS /RIS supplier charges														
Core PACS/RIS														
PACS Service Charge	Sub Total (Core PACS Services) + IF REQUIRED PACS embedded Voice Recognition Solution (per user) + Nuc Med Xeleris + selected "Cedars modules"	R	£0	£104,113	£178,480	£178,480	£178,480	£178,480	£178,480	£178,480	£178,480	£178,480	£208,227	**£1,740,180**
RIS Service Charge	Sub Total (Core RIS Services)	R	£0	£57,226	£98,101	£98,101	£98,101	£98,101	£98,101	£98,101	£98,101	£98,101	£114,451	**£956,485**
Supplier Deployment Charge	Professional Services for deployment + System Integration (with Trust existing systems)	R	£0	£10,603	£18,176	£18,176	£18,176	£18,176	£18,176	£18,176	£18,176	£18,176	£21,205	**£177,216**
Image Data extraction ('data localisation')	Outside investment scope	R	£0	£0		£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Image Data import into new PACS	Included in Deployment Charge	R		£0		£0	£0		£0	£0	£0	£0	£0	**£0**
RIS data migration	Included in Deployment Charge	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Additional Products Required		R	£0	£6,378	£10,934	£10,934	£10,934	£10,934	£10,934	£10,934	£10,934	£10,934	£12,756	**£106,607**
Subtotal														
Capital			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Revenue			**£0**	**£178,320**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£356,640**	**£2,980,487**
Total			**£0**	**£178,320**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£305,691**	**£356,640**	**£2,980,487**
Trust deployment costs														
New Client devices test and install		R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Local server elements supply and commission (PACS and RIS)	Transfer of BARCO Screen QA application software to ICT VM environment	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Local SAN elements (PACS and RIS) supply and commission	Not needed for GE solution	C	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Client devices PACS/RIS software commissioning	Delivered through existing LANdesk + 3 weeks of ICT band 6 tech support to review and diagnostic workstations	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Trust Deployment Project Team	Team to deploy Trust components of PACS/RIS solution (training, hardware,software, integration with Trust existing systems including Order Comms) assume 8 months	R	£5,400	£147,705	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£153,105**
End User and Tech support training	Included in deployment (line 42)	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
EMRAD Prog Mgmt costs	Assume trusts contribute and costs apportioned for each trust over 18 months	R	£33,610	£68,238	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£101,849**
Modality Engineer costs for on-site modality	3rd party costs based on 55 modalities	R	£0	£43,200	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£43,200**
Procurement Consortium membership	Removed as already forecasted and funded via EMRAD contributions	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
LSP service charge (up to GE go-live)	Assume exit at end of November and full LSP monthly service charge levied from Dec 2014 to March 2015 for extended LSP operation	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Trust infrastructure upgrades to meet WES requirements	Assumes memory upgrades to existing Agfa workstations (52 NUH + 4 TC) base units are required to meet WES standards = 56	R	£0	£11,200	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£11,200**
Loss on disposal of existing PACS equipment	Undepreciated amount of 2010 purchase	R	£0	£98,424	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£98,424**
Subtotal														
Capital			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Revenue			**£39,010**	**£368,767**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£407,778**
Total			**£39,010**	**£368,767**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£407,778**

Costs - FBC position (all costs £ exc VAT)	Cost explanation	(C)ap/ (R)ev	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total
Trust operational costs														
Local Live Services (e.g. PACS/RIS application support (Radiology and ICT staff)	Additional roles to exploit the use of PACS/RIS including training, adherence to best practice, support for benefits realisation	R	£0	£43,261	£51,913	£51,913	£51,913	£51,913	£51,913	£51,913	£51,913	£51,913	£60,565	**£519,130**
PACS/RIS ICT technical support		R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Medical Physics QA	Assume QA service continues as is	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Client devices PACS/RIS software upgrades	Delivered through existing LANdesk + 3 weeks of ICT band 6 tech support	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Trust contribution to EMRAD Live Services	Contribution to dedicated live services / contract management	R	£19,814	£29,720	£29,720	£29,720	£29,720	£29,720	£29,720	£29,720	£29,720	£29,720	£34,674	**£321,971**
Subtotal														
Capital			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Revenue			**£19,814**	**£72,981**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£95,239**	**£841,101**
Total			**£19,814**	**£72,981**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£81,633**	**£95,239**	**£841,101**
CR equipment														
Support of legacy CR equipment NUH	Support provided by Accenture at existing service charges until Nov 2014 exit - Assume CR to be replaced under new service arrangements in FY 2015/16 - NB clinical risk because of continued use of XP on QA	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Replacement of CR	Assume CR is replaced in FY2015/16 and Trust accept clinical risk of running XP on NX	C	£0	£467,910	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£467,910**
Support of new CR equipment	Assume CR is replaced in FY2015/16 as no Cap bids identified in 2014/15 support costs include Drystar printer and PAXPort	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Subtotal														
Capital			**£0**	**£467,910**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£467,910**
Revenue			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Total			**£0**	**£467,910**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£467,910**
Diagnostic workstations														
Support of Legacy Diagnostic workstation	ICT charges for support of upgraded HP7400	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Diagnostic workstations needed for UAT prior to DVP	Required prior to DVP to meet GE WES requirements included in line 48	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Support of new Diagnostic workstation equipment (provided through ICT	Included in replacement charges from ICT (excludes monitor refresh)	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Replacement of Diagnostic workstations + hi - res screens	Assume this is done as a 9 year rolling programme	C	£0	£0	£0	£229,755	£0	£0	£0	£0	£229,755	£0	£0	**£459,510**
Subtotal														
Capital			**£0**	**£0**	**£0**	**£229,755**	**£0**	**£0**	**£0**	**£0**	**£229,755**	**£0**	**£0**	**£459,510**
Revenue			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Total			**£0**	**£0**	**£0**	**£229,755**	**£0**	**£0**	**£0**	**£0**	**£229,755**	**£0**	**£0**	**£459,510**
Income from ASR of PACS RIS services														
PACS Service Charge cross-charges (see current SLA)	Assume new (SLA) charge will be XX% of existing SLS service charge based on current	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RIS Service Charge cross-charges (see current SLA)	Assume new (SLA) cahrge will be XX% of existing SLS service charge based on current	R	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
Subtotal														
Capital			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Revenue			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
Total			**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**
GRAND TOTAL														
Capital			**£0**	**£467,910**	**£0**	**£229,755**	**£0**	**£0**	**£0**	**£0**	**£229,755**	**£0**	**£0**	**£927,420**
Revenue			**£58,824**	**£620,068**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£451,878**	**£4,229,366**
Total			**£58,824**	**£1,087,978**	**£387,324**	**£617,080**	**£387,324**	**£387,324**	**£387,324**	**£387,324**	**£617,080**	**£387,324**	**£451,878**	**£5,156,786**

Appendix F List Of Potential Benefits

The following table presents a description of all of the potential benefits identified during the development of this FBC.

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
RA01	A PACS that replaces the current LSP PACS service	Can terminate existing PACS contract with LSP	No longer need to pay related LSP service charges on assumption these would continue in future years
RA02	A RIS that replaces the current RIS service	Can terminate existing RIS contract	No longer need to pay related service charges on assumption these would continue in future years
TR01	Image data sharing via common hosted image archive	Fewer unnecessary patient transfers to NUH	Reduced need to transfer patients to another Trust
TR02	Image data sharing via common hosted image archive	Reduced need for Radiology support staff to burn, import and fix-up CDs	1 band 4 wte time released for core duties because of reduced dependency on CDs for image transfer
RA05	Image data sharing via common hosted image archive	IEP used only for image sharing with Trusts outside the Consortium shared instance Radiology; Radiology staff time fully utilised for planned duties	Reduced unplanned need for Radiology staff who administrate the IEP image transfer requests
RA06	Shared Application Instance	Application upgrades are simpler and quicker	Reduced need for staff to support PACS and RIS application upgrades
RA07a	Image data sharing via common hosted image archive	Reduction in number of image 'retakes' when a patient is transferred between hospitals	Release of current radiology imaging (radiographer) and reporting (radiologist) resources for core duties
IT01	New Managed Service	Reduced dependency on Trust ICT support staff to support Trust hosted PACS and RIS servers	
TR03	Contract Structure includes "Additional Services"	No additional procurements needed for the "ologies" as these may be taken from the "Additional Services" provided under the contract	Future avoided cost of procuring PACS solutions for Cardiology, Endoscopy, etc
TR04	Image data sharing via common hosted image archive	All relevant images accessible 'on demand' by both referring and tertiary clinical (sub)specialists across Consortium Trusts allowing immediate expert opinion to be shared, e.g. Trent Cardiac Centre at NUH	Patient outcomes improved
RA07	Image data sharing via common hosted image archive	The number of points of failure inherent in current IEP technology is considerably reduced	Less PACS admin time spent on remedial work on failed or erroneous image transfers
TR05	Image and report sharing via common hosted image archive and common RIS	Pooling of Radiology reporting resources across the Consortium	Reduced costs to Trust of use of commercial reporting agencies such as Medica and Nighthawk
RA08	Externally hosted solution with resilient, secure high bandwidth WAN connections from the data centre to the Trust	'Instantaneous failover' as part of managed service hence increased availability of PACS/RIS	Reduction in disruption to patient services
RA09	Image data sharing via common	The number of points of failure inherent in current PACS	Reduced loss of clinical productivity

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
	hosted image archive	technology will be considerably reduced	
TR06	Image and report sharing via common hosted image archive and common RIS	Images and reports (recent and historical) available at point of care (Trauma)	Facilitates achievement of 4 hour ED wait target
RA10	Single RIS instance	Improved quality of patient related data	Reduction in numbers of mis-identified patients and hence risk that images are attributed to the wrong patient
TR07	Image and report sharing via common hosted image archive and common RIS	Severely injured patients imaged at **receiving trauma centres** as part of their initial clinical stabilisation, at which point images and reports will be immediately available for review by the **Major Trauma Centre** in Nottingham - or alternatively potentially reported at the Major Trauma Centre directly.	**Improved resource planning and patient outcomes** because of enhancement to and increased stability of the East Midlands Major Trauma Network transfer system due to ability to make prompt and appropriate clinical decisions regarding onward patient transfer, planning for theatre and/or other intervention, while the patient is still at the receiving trauma centre.
Ca01	Image and report sharing via common hosted image archive and common RIS	Removal (reduction?) of access to multiple IT systems or the use of IEP as an image transfer tool	**Improved patient care planning** through enhancement of cancer pathways across the East Midlands region because of improved support of regional Multidisciplinary Team meetings specifically the availability of appropriate images and associated reports
RA13	Image and report sharing via common hosted image archive and common RIS	Radiologists able to access a fully functioning radiology IT system regardless of their physical location within the EMRAD region. Regional on-call teams established	**Service improvement** to Radiology OOH services as a result of enhanced provision of consultant-level input OOH without requirement for on-site presence. Potential reduction in requirement for next-day service cancellation etc. and potential to release staff back to in-hours service whilst still providing high quality consultant-level supervision and expert opinion for the region OOH.
RA 11	Image and report sharing via common hosted image archive and common RIS	Clinicians able to access to a fully functioning radiology IT system regardless of their physical location within the EMRAD region.	**Service improvement** to Stroke, Spinal, Neurosurgery, and Paediatric services because images and associated reports are available as/when required
TR11	Image and report sharing via common hosted image archive and common RIS	Seamless sharing of all elements of patient data pertaining to radiology beyond Trust boundaries by removing (reducing?) need for image transfer using CDs or IEP	**Improved patient care and widening of patient choice** through provision of clinics closer to home that are able to be supported by specialist clinicians
TR12	Image and report sharing via common hosted image archive and common RIS	Provision of all elements of patient data pertaining to radiology to any appropriate remote workstation including those located at smaller local hospitals	**Improved utilisation of specialist clinical time** because of the ability to provide access to relevant (radiological) information at the point of need
RA14	Access to global worklists and acquired images via a common PACS and RIS and XDS I capability	the possibility of redistributing radiology reporting capacity according to a virtualised expertise-based rather than geographically-based model.	**Current radiology reporting resource time freed up** for cross-cover of time-sensitive investigations requiring expert opinion (cover for annual leave, sickness, recruiting gaps etc
RA12	Access to global worklists and acquired images via a common PACS and RIS and XDS I capability	Intra- EMRAD 'insourcing' of reporting work and reduced use of outsourced reporting provided by 'Medica' and 'Nighthawk' services	"associated cost and clinical benefits" [££'s if this is a CRB; what is the clinical benefit ? Improvement in the quality of the reports?]
TR13	Integration of other imaging specialties	A single point of access to clinical information for clinicians around	Improved clinical decision making due to improved access to

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
	into a common PACS environment (either part of new core or as an Additional Service within the wave 1 contract scope	the EMRAD region as a result of assimilating radiotherapy, cardiology, ophthalmology etc images into a single unified patient image system (PACS/RIS) forming an early step toward an electronic patient record, integrating the data-heavy elements of such a record into an easily clinically accessible system	multiple image elements and associated reports comprising a patient's record
TR08	Common radiology IT system (RIS) across multiple EMRAD trusts	A unified coding framework developed and implemented across all EMRAD Trusts.	**Improved quality of data** at regional level, leading to enhanced ability to benchmark, measure and potentially trade activity across the region/ between NHS organisations.
TR09	Common radiology IT system (RIS) across multiple EMRAD trusts	Development of future unified IT networks based on sharing agreements and infrastructure provisioned by EMRAD procurement	**Improved IT networking** between EMRAD Trusts with scope to develop and deploy further systems/architecture along similar lines (e.g. EPR)
M1	Reporting dashboard	Readily accessible and up to date RIS performance dashboard providing relevant and timely management information	**Increased Service capacity** because of the ability to optimise the utilisation of both the current equipment estate and existing staff resources on the basis of dashboard outputs
TR10	Single RIS instance that includes the required management reporting functions	Automatic transparent activity reports and invoicing between EMRAD Trusts where reporting has been undertaken by one Trust at the behest of another; payments processed more quickly.	**Reduced cost** of administrating the requesting/invoicing cycle
DM1	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Radiographer time released to perform core tasks (estimated at c. 10 seconds per imaging study) x150,000 studies/annum = 56 days/annum
DM2	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Reduction in transcription errors and reduction in missing data allowing legally compliant individual IRMER 2000 patient records
DM3	Dose management data analysis	Radiation dose information fed back routinely to referring clinicians	Potential improvement in clinician referral practice - e.g. reduction in unnecessary procedures and patient exposure
DM4	Dose management data analysis	Radiation dose information monitored routinely against diagnostic reference levels as required by IRMER 2000	Non-compliance with current IRR99 and IRMER 2000 legislation and future legislation mitigated with reduced probability of CQC and HSE enforcement notice and associated fines
DM5	Dose management data analysis	Consistent Imaging procedures established across EMRAD through routine inter-trust comparison of patient exposures	Fewer image retakes when images acquired at one trust are used by clinicians at another trust when a patient is transferred by how much?
DM6	Dose management data analysis	SFHFT patients receive reduced doses due to improved practice	Reduced risk of inducing a fatal cancer for patients with long standing illness or severe injury particularly in young patients
DM7	Dose management data analysis	Reduction in patient doses across east midlands	Shared practice across east midlands will reduce doses. Estimate that the monetary health value across east midlands based on conservative estimates is of the order of £5m. Based on a value of life saved of £50k (large underestimate)
DM8	Dose management - high dose alert functions	Radiation doses are monitored routinely against expected (acceptable/benchmarked) levels	Immediate indication of accidental overexposures enabling prompt remedial action to avoid repetition and possible need for review of the imaging procedure or operator re-training
DM9	Dose management data analysis	Ability to demonstrate quality of SFHFT services to patients, staff,	Quality of service i.e. Low radiation doses commensurate with

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised
		commissioners e.g. adherence to national and international best practice	optimum image quality can be demonstrated More patients attracted to SFHFT services growth opportunity / opportunities for R&D and publications
DM10	Dose management data analysis	Increased collaboration within imaging departments across EMRAD consortium	Data sharing exercise will foster collaboration between EMRAD consortium
DM11	Dose management data analysis	Rogue equipment at SFHFT identified earlier	Enables early intervention including remedial work on imaging modality and/or de-commissioning / replacement hence ensuring consistent high quality image outputs
DM12	Dose management data analysis	Radiology training / refresher better focused at SFH	Enables more optimal use of training resources through targeted training
DM13	Dose management data analysis	At SFH, reduced load on X-Ray tubes - longer life - cheaper maintenance?	
TR14	Image and report sharing via common hosted image archive and common RIS	MDT's are organised and performed more efficiently and effectively	Fewer cancelled MDT's due to unavailability of necessary patient data
TR15	Image and report sharing via common hosted image archive and common RIS	Extensive range of radiology images/reports and images from other specialities/trusts e.g. cardiology/medical photography all available at MDT's	Improved patient outcomes due to fewer repeat exams and better clinical decision making/care planning enabled by higher quality/quantity of clinical findings available
TR16	Common radiology IT system (RIS) across multiple EMRAD trusts	More streamlined operational services for Radiology which is more able to cope with increased imaging workload	Reduced need to additional in-house radiological staffing resources in response to higher workload

Appendix G Cash Releasing Benefits

The following tables present details of the cash releasing benefits associated with the new PACS/RIS solution and the original estimated cash releasing benefits as reported in the OBC, adjusted to 14/15 prices so as to be consistent with the price base of this FBC. For more information please see the Excel business case model available under separate cover. All financial values are in £.

Benefits phased over time - FBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total exc VAT
RA01	A PACS that replaces the current LSP PACS service	Can terminate existing PACS contract w ith LSP	No longer need to pay related LSP service charges on assumption these w ould continue in future years	NHIS	CRB		% kick-in PA:	0%	58%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						H	£564,451	£0	£329,263	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£658,526	**£5,503,397**
RA02	A RIS that replaces the current RIS service	Can terminate existing RIS contract	No longer need to pay related service charges on assumption these w ould continue in future years	NHIS	CRB		% kick-in PA:	0%	58%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						H	£44,556	£0	£25,991	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£51,982	**£434,421**
TR01	Depreciation of existing PACS assets			Trust	CRB		% kick-in PA:		58%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
						H	£19,050	£0	£11,049	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	£19,050	**£182,499**
RA05	Image data sharing via common hosted image archive	IEP used only for image sharing w ith Trusts outside the Consortium shared instance Radiology; Radiology staff time fully utilised for planned duties	Reduced unplanned need for Radiology staff w ho administrate the IEP image transfer requests	Radiology	CRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR05	Image and report sharing via common hosted image archive and common RIS	Pooling of Radiology reporting resources across the Consortium	Reduced costs to Trust of use of commercial reporting agencies such as Medica and Nighthaw k	Radiology	CRB		% kick-in PA:	0%	58%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						L	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RA12	Access to global w orklists and acquired images via a common PACS and RIS and XDS I capability	Intra- EMRAD 'insourcing' of reporting w ork and reduced use of outsourced reporting provided by 'Medica' and 'Nighthaw k' services	"associated cost and clinical benefits" [£'s if this is a CRB; w hat is the clinical benefit ? Improvement in the quality of the reports?]	Radiology +???	CRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR08	Common radiology IT system (RIS) across multiple EMRAD trusts	A unified coding framew ork developed and implemented across all EMRAD Trusts.	Improved quality of data at regional level, leading to enhanced ability to benchmark, measure and potentially trade activity across the region/ betw een NHS organisations.	EMRAD trusts	CRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
							Total	**£0**	**£366,303**	**£628,057**	**£628,057**	**£628,057**	**£628,057**	**£628,057**	**£628,057**	**£628,057**	**£628,057**	**£729,558**	**£6,120,317**

Benefits phased over time - OBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total exc VAT
RA01	A PACS that replaces the current LSP PACS service	Can terminate existing PACS contract with LSP	No longer need to pay related LSP service charges on assumption these would continue in future years	NHIS	CRB		% kick-in PA:	25%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	
						H	£564,451.00	£141,113	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£564,451	£0	**£5,221,172**
RA02	A RIS that replaces the current RIS service	Can terminate existing RIS contract	No longer need to pay related service charges on assumption these would continue in future years	NHIS	CRB		% kick-in PA:	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	
						H	£44,556.00	£22,278	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£44,556	£0	**£423,282**
TR01	Image data sharing via common hosted image archive	Fewer unnecessary patient transfers to NUH	Reduced need to transfer patients to another Trust	Trust	CRB		% kick-in PA:												
						M	£19,050	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RA05	Image data sharing via common hosted image archive	IEP used only for image sharing with Trusts outside the Consortium shared instance Radiology; Radiology staff time fully utilised for planned duties	Reduced unplanned need for Radiology staff who administrate the IEP image transfer requests	Radiology	CRB		% kick-in PA:												
						M	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR05	Image and report sharing via common hosted image archive and common RIS	Pooling of Radiology reporting resources across the Consortium	Reduced costs to Trust of use of commercial reporting agencies such as Medica and Nighthawk	Radiology	CRB		% kick-in PA:	0%	50%	100%	100%	100%	100%	100%	100%	100%	100%	0%	
						M	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
								£163,391	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£609,007**	**£0**	**£5,644,454**

Appendix H Non-Cash Releasing Benefits

The following tables present details of the non-cash releasing benefits associated with the new PACS/RIS solution and the original estimated non-cash releasing benefits as reported in the OBC, adjusted to 14/15 prices so as to be consistent with the price base of this FBC. For more information please see the Excel business case model available under separate cover. All financial values are in £.

Benefits phased over time - FBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total
TR02	Image data sharing via common hosted image archive	Reduced need for Radiology support staff to burn, import and fix-up CDs	1 band 4 w te time released for core duties because of reduced dependency on CDs for image transfer	Radiology	NCRB		% kick-in PA:	0%	75%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						M	£9,789	£0	£7,342	£9,789	£9,789	£9,789	£9,789	£9,789	£9,789	£9,789	£9,789	£11,421	**£97,078**
RA06	Shared Application Instance	Application upgrades are simpler and quicker	Reduced need for staff to support PACS and RIS application upgrades	PACS managers	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RA07a	Image data sharing via common hosted image archive	Reduction in number of image 'retakes' w hen a patient is transferred betw een hospitals	Release of current radiology imaging (radiographer) and reporting (radiologist) resources for core duties	Radiology	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
IT01	New Managed Service	Reduced dependency on Trust ICT support staff to support Trust hosted PACS and RIS servers		ICT	NCRB		% kick-in PA:	0%	75%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						H	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RA07	Image data sharing via common hosted image archive	The number of points of failure inherent in current IEP technology is considerably reduced	Less PACS admin time spent on remedial w ork on failed or erroneous image transfers	Radiology	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
RA14	Access to global w orklists and acquired images via a common PACS and RIS and XDS I capability	the possibility of redistributing radiology reporting capacity according to a virtualised expertise-based rather than geographically-based model.	Current radiology reporting resource time freed up for cross-cover of time-sensitive investigations requiring expert opinion (cover for annual leave, sickness, recruiting gaps etc	0	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
M1	Reporting dashboard	Readily accessible and up to date RIS performance dashboard providing relevant and timely management information	Increased Service capacity because of the ability to optimise the utilisation of both the current equipment estate and existing staff resources on the basis of dashboard outputs	Radiology	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
DM1	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Radiographer time released to perform core tasks (estimated at c. 10 seconds per imaging study) x150,000 studies/annum = 56 days/annum	Radiographers using diagnostic and interventional X-ray equipment	NCRB		% kick-in PA:		75%	100%	100%	100%	100%	100%	100%	100%	100%	117%	
						M	£9,036	£0	£6,777	£9,036	£9,036	£9,036	£9,036	£9,036	£9,036	£9,036	£9,036	£10,542	**£89,609**
DM5	Dose management data analysis	Consistent Imaging procedures established across EMRAD through routine inter-trust comparison of patient exposures	Few er image retakes w hen images acquired at one trust are used by clinicians at another trust w hen a patient is transferred by how much?	All users of diagnostic and interventional X-ray equipment, Patients	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
DM13	Dose management data analysis	At SFH, reduced load on X-Ray tubes - longer life - cheaper maintenance?	0	Radiology / hospital finance CIP?	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR14	Image and report sharing via common hosted image archive and common RIS	MDT's are organised and performed more efficiently and effectively	Few er cancelled MDT's due to unavailability of necessary patient data	Radiology	NCRB		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
							Total	**£0**	**£14,119**	**£18,826**	**£18,826**	**£18,826**	**£18,826**	**£18,826**	**£18,826**	**£18,826**	**£18,826**	**£21,963**	**£186,687**

Benefits phased over time - OBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total
TR02	Image data sharing via common hosted image archive	Reduced need for Radiology support staff to burn, import and fix-up CDs	1 band 4 w te time released for core duties because of reduced dependency on CDs for image transfer	Radiology	NCRB		% kick-in PA:	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
						H	£25,576	£12,788	£25,576	£25,576	£25,576	£25,576	£25,576	£25,576	£25,576	£25,576	£25,576	£25,576	**£268,552**
IT01	New Managed Service	Reduced dependency on Trust ICT support staff to support Trust hosted PACS and RIS servers	1 x ICT tech band 6 0.5w te time freed up for core duties. 1 x ICT tech band 6 0.5w te time freed up for core duties	ICT	NCRB		% kick-in PA:	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
							£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
								£12,788	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	**£25,576**	£268,552

Appendix I Future Avoided Costs

The following tables present details of the future avoided costs associated with the new PACS/RIS solution and the original estimated future avoided costs as reported in the OBC, adjusted to 14/15 prices so as to be consistent with the price base of this FBC. For more information please see the Excel business case model available under separate cover. All financial values are in £.

Benefits phased over time - FBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 4/25+25/2	Total exc VAT
TR03	Contract Structure includes "Additional Services"	No additional procurements needed for the "ologies" as these may be taken from the "Additional Services" provided under the contract	Future avoided cost of procuring PACS solutions for Cardiology, Endoscopy, etc	Trust	FAC		% kick-in PA:					100%							
						H	£200,000	£0	£0	£0	£0	£200,000	£0	£0	£0	£0	£0	£0	**£200,000**
TR09	Common radiology IT system (RIS) across multiple EMRAD trusts	Development of future unified IT networks based on sharing agreements and infrastructure provisioned by EMRAD procurement	Improved IT networking between EMRAD Trusts with scope to develop and deploy further systems/architecture along similar lines (e.g. EPR)	EMRAD Trusts/ CCGs	FAC		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR10	Single RIS instance that includes the required management reporting functions (4.27/28 of ISDS Vol 2)	Automatic transparent activity reports and invoicing between EMRAD Trusts where reporting has been undertaken by one Trust at the behest of another; payments processed more quickly	Reduced cost of administrating the requesting/invoicing cycle	Trust (including all parties who support this process)	FAC		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
TR16	Common radiology IT system (RIS) across multiple EMRAD trusts	More streamlined operational services for Radiology which is more able to cope with increased imaging workload	Reduced need to additional in-house radiological staffing resources in response to higher workload	EMRAD Trusts	FAC		% kick-in PA:												
						L		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	**£0**
							Total	**£0**	**£0**	**£0**	**£0**	**£200,000**	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£200,000**

Benefits phased over time - OBC position (£)

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Value PA when fully realised	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 4/25+25/2	Total exc VAT
TR03	Contract Structure includes "Additional Services"	No additional procurements needed for the "ologies" as these may be taken from the "Additional Services" provided under the contract	Future avoided cost of procuring PACS solutions for Cardiology, Endoscopy, etc	Trust	FAC		% kick-in PA:	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	
						H	£102,600	£0	£0	£0	£0	£102,600	£0	£0	£0	£0	£0	£0	**£102,600**

Appendix J Quality Benefits

The following table present details of the quality benefits associated with the new PACS/RIS solution and the original quality benefits as reported in the OBC. For more information please see the Excel business case model available under separate cover.

Ref	Enabling functionality/ facility	Changed state resulting	Description of benefit realised	Benefit owner(s)	Benefit type	Control over realisation	Benefit importance out of 10	Relative weight of benefits	FBC position		OBC position	
									Raw score	Weighted score	Raw score	Weighted score
RA08	Externally hosted solution with resilient, secure high bandwidth WAN connections from the data centre to the Trust	'Instantaneous failover' as part of managed service hence increased availability of PACS/RIS	Reduction in disruption to patient services	Trust	Q	H	10	4.8%	3	14	3	14
RA09	Image data sharing via common hosted image archive	The number of points of failure inherent in current PACS technology will be considerably reduced	Reduced loss of clinical productivity	Radiology	Q	L	10	4.8%	3	14	3	14
DM2	Dose management database functionality and DICOM DR modality integration	Automatic capture of radiation dose information direct from modality to CRIS	Reduction in transcription errors and reduction in missing data allowing legally compliant individual IRMER 2000 patient records	Radiographers, managers	Q	H	10	4.8%	3	14	0	0
DM3	Dose management data analysis	Radiation dose information fed back routinely to referring clinicians	Potential improvement in clinician referral practice - e.g. reduction in unnecessary procedures and patient exposure	Patients, clinicians	Q	H	10	4.8%	3	14	0	0
DM4	Dose management data analysis	Radiation dose information monitored routinely against diagnostic reference levels as required by IRMER 2000	Non-compliance with current IRR99 and IRMER 2000 legislation and future legislation mitigated with reduced probability of CQC and HSE enforcement notice and associated fines	Radiology Directorate and Trust	Q	H	10	4.8%	3	14	0	0
DM6	Dose management data analysis	NUH patients receive reduced doses due to improved practice	Reduced risk of inducing a fatal cancer for patients with long standing illness or severe injury particularly in young patients	Patients	Q	H	10	4.8%	3	14	0	0
DM8	Dose management - high dose alert functions	Radiation doses are monitored routinely against expected (acceptable/benchmarked) levels	Immediate indication of accidental overexposures enabling prompt remedial action to avoid repetition and possible need for review of the imaging procedure or operator re-training	All users of diagnostic and interventional X-ray equipment	Q	H	10	4.8%	3	14	0	0
DM9	Dose management data analysis	Ability to demonstrate quality of NUH services to patients, staff, commissioners e.g. adherence to national and international best practice	Quality of service i.e. Low radiation doses commensurate with optimum image quality can be demonstrated More patients attracted to NUH / Medical Physics services growth opportunity / opportunities for R&D and publications	All users of diagnostic and interventional X-ray equipment	Q	H	6	2.9%	3	9	0	0
DM11	Dose management data analysis	Rogue equipment at NUH identified earlier	Enables early intervention including remedial work on imaging modality and/or de-commissioning / replacement hence ensuring consistent high quality image outputs	Patients, Radiology	Q	H	10	4.8%	3	14	0	0
DM12	Dose management data analysis	Radiology training / refresher better focused at NUH	Enables more optimal use of training resources through targetted training	Radiology staff / trainers	Q	H	7	3.3%	3	10	0	0
TR15	Image and report sharing via common hosted image archive and common RIS	Extensive range of radiology images/reports and images from other specialities/trusts e.g. cardiology/medical photography all available at MDT's	Improved patient outcomes due to fewer repeat exams and better clinical decision making/care planning enabled by higher quality/quantity of clinical findings available	Patients, clinicians	Q	L	10	4.8%	3	14	0	0
							210	**100%**		**281**		**59**

Appendix K Quantified Risk Appraisal

Work was undertaken to identify the nature of individual risks and to then place a value on them should they occur, determine the probability of them occurring and determine the extent to which they can be passed across to the supplier, resulting in a financial value for the Trust-retained risk. The results are presented in the following table. Given the amount of information that has been recorded per risk, the text is inevitably very small, so please refer to the relevant risk sheets within the Excel business case model if needs be. All financial values are in £. Note that risks were not quantified at OBC stage, so a comparison with the OBC position is not provided

Risk values phased over time - FBC position (all costs £ exc VAT)

	Risk Description	Risk Impact	Mitigation	Principal owner	Explanation of value	Risk scenario	Estimated cost if risk materialised		Prob-ability	Resulting risk value	% Trust retained	Include in contingency?	If Y, % capital		Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26
A - Design & Development Risks																									
A1	Insufficient user consultation regarding requirements	Requirements built into contract schedules do not meet user needs and new requirements emerge once solution is deployed, requiring supplier to charge for new functionality	Ensure extensive consultation with users regarding their requirements	Trust	Expected/higher/worst case: 20%/30%/40% uplift in PACS and RIS application software costs. All spread over live service period	Worst case	£808,999	total	2%	£16,180	100%	Y	0%	% occurrence PA	0%	6%	10%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£539,333	total	5%	£26,967				Trust + supplier risk overall	£0	£4,195	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£9,788
						Expected	£269,666	total	10%	£26,967				Trust retained expected	£0	£1,613	£2,766	£2,766	£2,766	£2,766	£2,766	£2,766	£2,766	£2,766	£3,765
						Total	£0		17%	£0				Trust retained overall	£0	£4,195	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£9,788
						Overall				£70,113				Total contingency	£0	£4,195	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£9,788
A2	Documented Trust requirements not sufficiently robust - e.g. specification does not accurately reflect user requirements or is vague/unclear	System modifications required once issues with documented requirements emerge, incurring extra supplier charges to change functionality	Extensive quality assurance of requirements documentation by both Trust and supplier staff	Trust	Expected/higher/worst case: 20%/30%/40% uplift in PACS and RIS application software costs. All spread over live service period	Worst case	£808,999	total	2%	£16,180	100%	N	0%	% occurrence PA	0%	50%	20%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£539,333	total	5%	£26,967				Trust + supplier risk overall	£0	£35,057	£14,023	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£9,788
						Expected	£269,666	total	10%	£26,967				Trust retained expected	£0	£13,483	£5,393	£2,766	£2,766	£2,766	£2,766	£2,766	£2,766	£2,766	£3,765
						None	£0		17%	£0				Trust retained overall	£0	£35,057	£14,023	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£7,191	£9,788
						Overall				£70,113				Total contingency	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
A3	Supplier configuration design is inappropriate - for example by not accurately reflecting user and business process requirements or through inappropriate use of system parameters	Extra resources required to rectify supplier configuration and to retrain users once rectified	Extensive user acceptance testing (potentially mitigated in GE case by Extra resources in EMRAD multi-trust multi-expertise team - slack in go-live deadline	Trust	Expected/higher/worst case: 20%/30%/40% uplift in deployment team costs up to DVP to correct the config errors - applies during deployment period only	Worst case	£356,814	total	2%	£7,136	100%	Y	0%	% occurrence PA	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£331,327	total	5%	£16,566				Trust + supplier risk overall	£0	£63,462	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£305,841	total	13%	£39,759				Trust retained expected	£0	£39,759	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£63,462	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£63,462				Total contingency	£0	£63,462	£0	£0	£0	£0	£0	£0	£0	£0	£0
A4	Users not sufficiently engaged in project - e.g. regarding overall objectives, selection of preferred supplier, deployment timescales, impact on them during implementation and once service is live	Users do not play their part in the deployment, and subsequent use of the solution resulting in low take-up of solution and reduced benefits	Extensive communication and engagement with users throughout the project Bidder selection processes, deployment timetable, configuration of the solution, adequate training and on-going specialist local resource to ensure best practice use of the solution	Trust	Expected/higher/worst case: 10%/20%/30% reduction in all benefits other than avoided LSP charges. All spread over live service period	Worst case	£116,006	total	2%	£2,320	100%	N		% occurrence PA	0%	4%	5%	5%	57%	5%	5%	5%	5%	5%	7%
						Higher	£77,337	total	5%	£3,867				Trust + supplier risk overall	£0	£409	£546	£546	£6,346	£546	£546	£546	£546	£546	£743
						Expected	£38,669	total	13%	£5,027				Trust retained expected	£0	£184	£245	£245	£2,845	£245	£245	£245	£245	£245	£333
						None	£0		20%	£0				Trust retained overall	£0	£409	£546	£546	£6,346	£546	£546	£546	£546	£546	£743
						Overall				£11,214				Total contingency	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
B - Deployment Risks																									
B1	Image data migration time and/or complexity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	a) Image Data extraction ('data localisation') is accomplished within the agreed exit plan to be performed within the current LSP contract for PACS and b) data migration into the new PACS has relevant contingency/tolerances applied. See ACUO report for data quality assurance	Supplier	Expected/higher/worst case = defer go live by 2/4/6 months so 2/4/6 months extra LSP charges at full LSP price plus 2/4/6 months extra Trust deployment resources GE only	Worst case	£537,093	one-off	3%	£16,113	25%	Y	0%	% occurrence PA	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£358,062	one-off	6%	£21,484				Trust + supplier risk overall	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£179,031	one-off	11%	£19,693				Trust retained expected	£0	£4,923	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£14,322	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£57,290				Total contingency	£0	£14,322	£0	£0	£0	£0	£0	£0	£0	£0	£0
B2	New interfaces (e.g. Peer Vue critical alerts, Active Directory access control for on/off-site access and PIX manager interfaces to Trust MPIs) do not work properly plus interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Dedicated Trust ICT interface development team resource available and access to supplier expertise	Trust	Expected/higher/worst case = defer go live by 2/4/6 months so 2/4/6 months extra LSP charges at full LSP price plus 2/4/6 months extra Trust deployment resources GE only	Worst case	£537,093	one-off	3%	£16,113	80%	Y	0%	% occurrence PA	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£358,062	one-off	6%	£21,484				Trust + supplier risk overall	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£179,031	one-off	11%	£19,693				Trust retained expected	£0	£15,755	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£45,832	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£57,290				Total contingency	£0	£45,832	£0	£0	£0	£0	£0	£0	£0	£0	£0
B3	Suppliers' deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Possible mitigation by including penalty charge on Supplier contract	Shared 50:50 with supplier	Expected/higher/worst case = defer go live by 2/4/6 months so 2/4/6 months extra LSP charges at full LSP price plus 2/4/6 months extra Trust deployment resources GE only	Worst case	£537,093	total	3%	£16,113	50%	Y	0%	% occurrence PA	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£358,062	total	6%	£21,484				Trust + supplier risk overall	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£179,031	total	11%	£19,693				Trust retained expected	£0	£9,847	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£28,645	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£57,290				Total contingency	£0	£28,645	£0	£0	£0	£0	£0	£0	£0	£0	£0
B4	Trust's deployment capability and capacity underestimated	Go live date deferred and so current LSP contract extended and Trust deployment team retained for longer	Robust programme planning and management (evidenced by success of EMRAD procurement stage)	Trust	Expected/higher/worst case = defer go live by 2/4/6 months so 2/4/6 months extra LSP charges at full LSP price plus 2/4/6 months extra Trust deployment resources GE only	Worst case	£537,093	total	3%	£16,113	100%	Y	0%	% occurrence PA	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£358,062	total	6%	£21,484				Trust + supplier risk overall	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£179,031	total	11%	£19,693				Trust retained expected	£0	£19,693	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£57,290				Total contingency	£0	£57,290	£0	£0	£0	£0	£0	£0	£0	£0	£0

Risk values phased over time - FBC position (all costs £ exc VAT)

	Risk Description	Risk Impact	Mitigation	Principal owner	Explanation of value	Risk scenario	Estimated cost if risk materialised		Prob-ability	Resulting risk value	% Trust retained	Include in contingency?	If Y, % capital		Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26
C - Operational Risks																									
C1	Supplier's product does not meet Trust functional requirements ready for DVP	Separate functionality has to be implemented and interfaced in order to satisfy missing requirements	Ensure preferred supplier has confirmed it can meet all requirements prior to signing contracts	Trust	Expected/higher/worst case: 20%/30%/40% uplift in PACS and RIS application software costs in FY 2015/16	Worst case	£71,328	total	2%	£1,427				% occurrence PA	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
						Higher	£53,496	total	5%	£2,675				Trust + supplier risk overall	£0	£4,369	£4,369	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£35,664	total	13%	£4,636	10%	Y	0%	Trust retained expected	£0	£232	£232	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		20%	£0				Trust retained overall	£0	£437	£437	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£8,738				Total contingency	£0	£437	£437	£0	£0	£0	£0	£0	£0	£0	£0
C2	New legislative or regulatory changes require new functionality that is outside the original requirements	Supplier needs to modify system in order to meet new requirements and charge the Trust accordingly	Compliance stipulated in ISFT and in contract	Trust	Expected/higher/worst case: 20%/30%/40% uplift in PACS and RIS application software costs. All spread over live service period	Worst case	£71,328	total	2%	£1,427				% occurrence PA	0%	6%	10%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£53,496	total	5%	£2,675				Trust + supplier risk overall	£0	£523	£896	£896	£896	£896	£896	£896	£896	£896	£1,220
						Expected	£35,664	total	13%	£4,636	1%	Y	0%	Trust retained expected	£0	£3	£5	£5	£5	£5	£5	£5	£5	£5	£6
						Total	£0		20%	£0				Trust retained overall	£0	£5	£9	£9	£9	£9	£9	£9	£9	£9	£12
						Overall				£8,738				Total contingency	£0	£5	£9	£9	£9	£9	£9	£9	£9	£9	£12
C3	Supplier's product does not meet Trust performance requirements, causing loss of productivity in the form of reporting backlog and delays to patient pre-imaging processes	Need to hold additional reporting sessions to clear backlog and employ extra temporary staff to manage patient appointments etc and do remedial work to fix the problem	Ensure appropriate service performance levels are set to benchmark system load testing prior to DVP and throughout operational life	Supplier	Assume cost of additional reporting sessions and extra temporary staff equates to a 20%/30%/40% (expected/higher/worst case) uplift in PACS managed service costs	Worst case	£71,328	total	2%	£1,427				% occurrence PA	0%	6%	10%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£53,496	total	5%	£2,675				Trust + supplier risk overall	£0	£523	£896	£896	£896	£896	£896	£896	£896	£896	£1,220
						Expected	£35,664	total	13%	£4,636				Trust retained expected	£0	£83	£143	£143	£143	£143	£143	£143	£143	£143	£194
						None	£0		20%	£0	30%	Y	0%	Trust retained overall	£0	£157	£269	£269	£269	£269	£269	£269	£269	£269	£366
						Overall				£8,738				Total contingency	£0	£157	£269	£269	£269	£269	£269	£269	£269	£269	£366
C4	Loss of service based on supplier provided / managed component , for example due to data centre(s) failure	Business as usual (BAU) impact (patient care) and need to hold additional reporting sessions to clear backlog and employ extra temporary staff to manage patient appointments etc	Highly replicated system including 2 x Data Centres and failover to local SAP/cache components and service points in contract	Shared 50:50 with supplier	Assume cost of additional reporting sessions and extra temporary staff equates to a 10%/20%/30% (expected/higher/worst case) uplift in PACS managed service costs	Worst case	£53,496	total	1%	£535				% occurrence PA	0%	6%	10%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£35,664	total	3%	£1,070				Trust + supplier risk overall	£0	£160	£274	£274	£274	£274	£274	£274	£274	£274	£373
						Expected	£17,832	total	6%	£1,070				Trust retained expected	£0	£32	£55	£55	£55	£55	£55	£55	£55	£55	£75
						None	£0		10%	£0	50%	Y	0%	Trust retained overall	£0	£80	£137	£137	£137	£137	£137	£137	£137	£137	£187
						Overall				£2,675				Total contingency	£0	£80	£137	£137	£137	£137	£137	£137	£137	£137	£187
D - Termination Risks																									
D1	Major commercial problems emerge such as supplier bankruptcy or dispute over contractual responsibilities	Need to negotiate alternative arrangements with supplier or in worst case procure a new supplier	Oblige supplier to notify changes in financial stability and ensure they understand and agree to everything they sign up to. Include within the contract a financial distress schedule giving the Trust remedies should the supplier's financial health fail - software held in Escrow - achieve BAU with new supplier in data centre	Supplier	Expected/higher/worst case = extra cost of £0.5m/£1m/£2m to negotiate alternative arrangements or reprocure and transition to new supplier, noting that remedies in the contract would pass some of this risk to the supplier	Worst case	£2,000,000	total	1%	£20,000				% occurrence PA	0%	6%	10%	10%	10%	10%	10%	10%	10%	10%	14%
						Higher	£1,000,000	total	3%	£30,000				Trust + supplier risk overall	£0	£4,786	£8,205	£8,205	£8,205	£8,205	£8,205	£8,205	£8,205	£8,205	£11,168
						Expected	£500,000	total	6%	£30,000				Trust retained expected	£0	£718	£1,231	£1,231	£1,231	£1,231	£1,231	£1,231	£1,231	£1,231	£1,675
						None	£0		10%	£0				Trust retained overall	£0	£1,915	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£4,467
						Overall				£80,000	40%	Y	0%	Total contingency	£0	£1,915	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£3,282	£4,467
D2	Trust seeks early termination (for whatever reason)	Penalty charges for early termination in supplier contract	Robust procurement process that supports Trust long term plans + sign-off at board level and NTDA	Trust	Expected/higher/worst case scenario = extra cost of £0.5m/£1m/£2m to negotiate alternative arrangements or reprocure and transition to new supplier, noting that remedies in the contract would pass some of this risk to the supplier	Worst case	£2,000,000			£0				% occurrence PA	0%	10%	10%	10%	10%	10%	10%	10%	10%	10%	12%
						Higher	£1,000,000			£0				Trust + supplier risk overall	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Expected	£500,000			£0				Trust retained expected	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
						None	£0		0%	£0	40%	Y	0%	Trust retained overall	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
						Overall				£0				Total contingency	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
					Totals					**Trust + supplier risk overall**				**595,542.87**	**0.00**	**342,643.12**	**36,400.32**	**25,199.93**	**30,999.93**	**25,199.93**	**25,199.93**	**25,199.93**	**25,199.93**	**25,199.93**	**34,299.91**
										Trust retained risk - expected				**179,272.68**	**0.00**	**106,325.47**	**10,068.72**	**7,209.39**	**9,809.39**	**7,209.39**	**7,209.39**	**7,209.39**	**7,209.39**	**7,209.39**	**9,812.78**
										Trust retained risk - overall				**439,226.14**	**0.00**	**251,805.54**	**25,893.59**	**18,625.16**	**24,425.16**	**18,625.16**	**18,625.16**	**18,625.16**	**18,625.16**	**18,625.16**	**25,350.91**
										Capital contingency - overall				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
										Revenue contingency - overall				**318,701.42**	**0.00**	**216,339.46**	**11,325.02**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**14,819.97**
										Total contingency - overall				**318,701.42**	**0.00**	**216,339.46**	**11,325.02**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**10,888.14**	**14,819.97**
										Supplier risk - expected				**156,316.73**	**0.00**	**90,837.58**	**10,506.73**	**6,574.78**	**6,574.78**	**6,574.78**	**6,574.78**	**6,574.78**	**6,574.78**	**6,574.78**	**8,949.00**

Appendix L Optimism Bias Assessment

The following table presents the outcomes of the optimism bias assessment. In accordance with DH Capital Investment Branch guidance, the optimism bias has been set to zero for those contributory factors that are already costed within the risk assessment. The outcome is that all of the optimism bias factors have been covered off via the risk assessment, with the outcome being an optimism bias cost uplift of 0%.

Optimism Bias			FBC position - total		OBC position - total	
			100%	upper bound		upper bound
Factor that contributes to optimism bias	Contribution to upper bound	How determine contribution after mitigation	Contribution after mitigation	Explanation of extent of mitigation	Contribution after mitigation	Explanation of extent of mitigation
Insufficient user consultation re requirements	4%	How far have users been involved in scoping the system and to what extent have you involved users in the Project Board, Project Teams etc?	0%	Covered via risk A1	0%	Not included in OBC
User acceptance of solution underplayed	15%	How far have users been engaged in the project and what evidence of user support do you have? You should think about all relevant users: clinical, administrative, management and any external users.	0%	Covered via risk A2, A5	0%	Not included in OBC
Level of change from existing systems and work practices underplayed	10%	What magnitude of change will result from the implementation of this project? E.g. a replacement pathology system may involve less change than the implementation of a Trust's first pathology system or a PACS.	0%	Covered via risk A3	0%	Not included in OBC
Output specification not sufficiently robust	20%	How well have you defined the scope of the system requirements? What is the risk of scope creep? In how much detail have you defined the benefits you expect to accrue as a result of this project?	0%	Covered via risk A2	0%	Not included in OBC
Interfaces to other systems insufficiently understood (number and novelty, including to legacy systems and in turn their links to other legacy systems)	5%	Interfaces are a major area of weakness in an IM&T project. In general the more interfaces that are required the more risky the project. You should also consider whether a supplier has interfaced their system to your legacy systems elsewhere.	0%	Covered via risk B10	0%	Not included in OBC
Complexity of required contract structure (including payment mechanisms) misjudged	7%	Which contract will you be using? How will you make your payments - monthly? Against the achievement of agreed milestones? Yearly? How does the contract deal with under/non-performance? Do you have a system of payment deductions to cover this?	0%	Covered via risk D1	0%	Not included in OBC
Contractors' capability and capacity underestimated	12%	Does this company have a proven track record of delivery? Do they have the number and quality of staff to deliver the project? What is the competition on the market for these systems? What is the likely interest in the market for this project?	0%	Covered via risk B11	0%	Not included in OBC
Client capability and capacity underestimated	12%	What are your resources for delivering the project? Do you have the relevant people to manage this project? Are you using PRINCE2? Do you have trained PRINCE2 trained people on the project? Does the Trust have a track record of successful delivery of IM&T projects?	0%	Covered via risk B12	0%	Not included in OBC
Sensitivity of project outcomes to legislative and regulation changes underestimated	15%	How stable do you consider the policy environment to be? How likely is it that policy or standards may change during the lifetime of the project? If you don't know then you can't mitigate this very much.	0%	Covered via risk C4	0%	Not included in OBC
	100%		**0%**		**0%**	
			0.0%		**0.0%**	

Appendix M Value For Money Appraisal

This appendix presents the value for money of the preferred bidder's solution based on the total costs, risks and benefits, and compares the outcome with the anticipated value for money position stated within the OBC. The first table presents the 'undiscounted' figures at today's prices, with the second table using 'discounted'' figures – i.e. with future costs translated into their current value - so as to generate net present values. All financial values are in £.

1. Value For Money Comparison - Undiscounted

Detail - undiscounted (all financial figures £ exc VAT)	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total contract
FBC position												
Capital expenditure exc VAT	0	-467,910	0	-229,755	0	0	0	0	-229,755	0	0	**-927,420**
Capital expenditure optimism bias uplift	0	0	0	0	0	0	0	0	0	0	0	**0**
Revenue expenditure exc VAT	-58,824	-620,068	-387,324	-387,324	-387,324	-387,324	-387,324	-387,324	-387,324	-387,324	-451,878	**-4,229,366**
Revenue expenditure optimism bias uplift	0	0	0	0	0	0	0	0	0	0	0	**0**
Total expenditure exc VAT	**-58,824**	**-1,087,978**	**-387,324**	**-617,080**	**-387,324**	**-387,324**	**-387,324**	**-387,324**	**-617,080**	**-387,324**	**-451,878**	**-5,156,786**
Plus cost of risk retained	0	-252,126	-26,446	-19,178	-24,978	-19,178	-19,178	-19,178	-19,178	-19,178	-25,995	**-444,611**
Less cash releasing benefits	0	366,303	628,057	628,057	628,057	628,057	628,057	628,057	628,057	628,057	729,558	**6,120,317**
Less future avoided costs	0	0	0	0	200,000	0	0	0	0	0	0	**200,000**
Less non-cash releasing benefits	0	14,119	18,826	18,826	18,826	18,826	18,826	18,826	18,826	18,826	21,963	**186,687**
Less societal benefits	0	0	0	0	0	0	0	0	0	0	0	**0**
Total undiscounted	**-58,824**	**-959,682**	**233,112**	**10,625**	**434,581**	**240,381**	**240,381**	**240,381**	**10,625**	**240,381**	**273,647**	**905,607**
Risk score												**0**
Quality benefits score												**281**

2. Value For Money Comparison - Discounted

Detail - discounted (all financial figures £ exc VAT)	Yr 0 14/15	Yr 1 15/16	Yr 2 16/17	Yr 3 17/18	Yr 4 18/19	Yr 5 19/20	Yr 6 20/21	Yr 7 21/22	Yr 8 22/23	Yr 9 23/24	Yr 10 24/25+25/26	Total contract
Discount Factors @ 3.50%	**1.000**	**0.966**	**0.934**	**0.902**	**0.871**	**0.842**	**0.814**	**0.786**	**0.759**	**0.734**	**0.715**	
FBC position												
Capital expenditure exc VAT	0	-452,087	0	-207,226	0	0	0	0	-174,479	0	0	**-833,792**
Capital expenditure optimism bias uplift	0	0	0	0	0	0	0	0	0	0	0	**0**
Revenue expenditure exc VAT	-58,824	-599,100	-361,571	-349,344	-337,531	-326,117	-315,089	-304,433	-294,139	-284,192	-323,112	**-3,553,452**
Revenue expenditure optimism bias uplift	0	0	0	0	0	0	0	0	0	0	0	**0**
Total expenditure exc VAT	**-58,824**	**-1,051,187**	**-361,571**	**-556,570**	**-337,531**	**-326,117**	**-315,089**	**-304,433**	**-468,617**	**-284,192**	**-323,112**	**-4,387,244**
Plus cost of risk retained	0	-243,600	-24,688	-17,297	-21,767	-16,147	-15,601	-15,073	-14,564	-14,071	-18,588	**-401,395**
Less cash releasing benefits	0	353,916	586,298	566,471	547,315	528,807	510,925	493,647	476,954	460,825	521,665	**5,046,823**
Less future avoided costs	0	0	0	0	174,288	0	0	0	0	0	0	**174,288**
Less non-cash releasing benefits	0	13,642	17,574	16,980	16,405	15,851	15,315	14,797	14,296	13,813	15,705	**154,376**
Less societal benefits	0	0	0	0	0	0	0	0	0	0	0	**0**
Total discounted	**-58,824**	**-927,229**	**217,613**	**9,583**	**378,712**	**202,394**	**195,550**	**188,937**	**8,069**	**176,375**	**195,669**	**586,849**
Risk score												**0**
Quality benefits score												**281**

Appendix N EMRAD Members Agreement

The example embedded in soft copy below is for United Lincolnshire Hospitals NHS Trust. There are 6 other identical agreements for authorisation and sign-off each EMRAD trust.

EMRAD Membership Agreement Final 1102

Appendix O EMRAD Project Team Member Roles

(RACI) roles of each project member of the EMRAD procurement team and the external advisors (re documentation) are presented below.

Stage	Notes	Key Document	Senior Responsible Owner	PACS Live Services Lead/Programme QA	EMRAD Programme Director	IT Workstream Lead	IT workstream	IG Specialist	Non Radiology Workstream Lead	Non Radiology Workstream	PACS Workstream Lead	PACS Workstream	Radiology Workstream Lead	Radiology Workstream	Commercial Workstream Lead	Commercial Workstream	Business Case Lead	Radiology Business Manager	Finance	Procurement Lead	Legal Adviser	Business Case External Adviser	NUH Project Accountant	EMRAD CEOs	Investment Governance Committee	Finance Investment Committee	NUH Trust Board	NHS Trust Development Authority
			NUH Director of ICT and SIRO	HSCIC Live Services Lead	ICT Services [NUH]	IT Deputy Director [NGH]	Representing each of the 7 Consortium me	NUH Information Security and Risk Manage	Consultant Physician Diabetes & Endocrino	Representing each of the 7 Consortium me	PACS Manager [NUH]	Representing each of the 7 Consortium me	Consultant neuro radiologist [NUH]	Representing each of the 7 Consortium me	Strategic Systems Analyst [NUH]	Representing each of the 7 Consortium me	Strategic Systems Analyst [NUH]	NUH Radiology Directorate General Manag	Project Accountant [NUH]	Finance and Procurement [IT Category]	Browne and Jacobson	Evo Consulting	Finance and Procurement [NUH]	Representing each of the 7 Consortium me	NUH	NUH	NUH Trust Board	HSCIC
Investment Approvals	Investment Proposals	Strategic Outline Case (EMRA	R/A	R/A											I	I	I					I		*				
		Outline Business Case (NUH)	R	C	I			I	I		I		C		A	I	A	C	C	C		C	C	*	*	*	*	*
		Outline Business Case (Gene	I		I											C						C						
		Full Business Case (NUH)	R	C	C			I	I		I		C		A	I	A	C	C	C		C	C	*	*	*	*	*
		Full Business Case (Generic)	I		C											C						C						
Bidder Pre-Qualification	Pre-Qualification Documenta	OJEU Notice	I	C	R	I	I		I	I	C	I	C	I	C	I	C	I	I	A	C							
		Pre-qualification	I	C	R	I	I	I	I	I	C	I	C	I	C	I	C	I	I	A	C							
		Information (MDI)	I	C	R	C	I	C	C	I	C	I	C	I	C	I	C	I	I	A	I							
		PQQ Evaluation Scoring	I	I	A	A	C	A	A	C	A	C	A	C	A	C	A	A	A	A	I							
		PQQ end stage report	I	I	R	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	I							
Invitation to Participate in Dialogue (ITPD) / Invitation to Submit Outline Solution (ISOS)	to Bidders, Evaluation Criteria and Additional Information	(ITPD Vol 1)	I	I	R	C	I	I	C	I	C	I	C	I	C	I	C	C	C	A	C							
	Outline Service Specification	(ITPD Vol 2)	I	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I	I							
	Evaluation of Outline Service	ITPD Evaluation Scoring	I	C	R	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I							
		ITPD end stage report	I	I	R	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	I							
Invitation to Participate in Dialogue (ITPD) / Invitation to Submit Detailed Solutions (ISDS)	to Bidders, Evaluation Criteria and Additional Information	(ISDS Vol 1)	I	I	R	C	I	I	C	I	C	I	C	I	C	I	C	C	C	A	C							
	Detailed Service Specificatio	(ISDS Vol 2)	I	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I	I							
	Evaluation of Detailed Servic	ISDS Evaluation Scoring	I	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I							
		ISDS end stage report	I	I	R	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	I							
Invitation to Participate in Dialogue (ITPD) / Invitation to Submit Final Tender Stage (ISFT)	to Bidders, Evaluation Criteria and Additional Information	(ISFT Vol 1)	I	I	R	C	I	I	C	I	C	I	C	I	C	I	C	C	C	A	C							
	Detailed Service Specificatio	(ISFT Vol 2)	I	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I	I							
	Evaluation of Final Tenders	ISFT Evaluation Scoring	I	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I							
		ISFT end stage report	I	I	R	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	I							
Legal and Contractual Documents	provision of PACS and RIS to EMRAD Members	Terms and Conditions and Schedules	C	C	R	C	I	C	C	I	C	I	C	I	C	I	C	C	C	C	A	I	I	I	I	I	I	I
	provision of PACS and RIS to any NHS body in England	Terms and Conditions and Schedules	C	C	R	C	I	C	C	I	C	I	C	I	C	I	C	C	C	C	A	I	I	I	I	I	I	I
	Framework of detailed rules governing the management of the EMRAD Programme	EMRAD Members Agreement (Wave 1)	C	I	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A	I	I	C	I	I	I	I
	Body may access the Services;	Wave 2 Access Agreement	C	I	R	C	I	C	C	I	C	I	C	I	C	I	C	C	C	C	A	I	I	I	I	I	I	I
	applying to all EMRAD team members	Non-Disclosure Agreement	C	R	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	I	I	I	I	I	I	I	I

R	Responsible – for ensuring the document was created
A	Accountable – for the actual development of the document
C	Consulted – during the development of the document (and may have input to I
I	Informed – were aware of and provided with copies of the document as deem
*	Formal Approval

Appendix P Procurement Documents

Documentation Name	Document
Qualification for the use of Competitive Dialogue	OBC statement qualifying use of the (
Risk assessment of options for route to market	Copy of PACS Procurement Route M
Programme highlight report concerning issue of the PIN	Highlight Report 21062103.docx
OJEU Notice	Final Notice.pdf
Procurement End of Stage Report (Note – this is WIP with EMRAD procurement Lead)	PACS PROCUREMENT REPC
Bidder down-selection	Summary of Procurement stages a

Appendix Q Wave 2 Access Agreement

Access Agreement 13022014.doc

Appendix R EMRAD Board and Live Service Team

Responsibilities of the EMRAD Board and Live Services teams are as follows:

Role	Key Responsibilities
EMRAD Commercial Manager (Part Time)	Provide overall management of EMRAD including the production of monthly reports for presentation to individual member Trusts Manage the commercial aspects of the procurement of the new systems, ensuring that there is an open and fair competition according to European law and guidelines Develop and manage the contract terms to ensure that the new contract terms reflect the services being purchased Provide contract governance and ongoing commercial management of the contract once it has been awarded Enlist legal and procurement support as required
EMRAD Managing Director	Manage the EMRAD Programme on a day to day basis including coordination of meetings, minutes, project plan, risk and issue logs. Liaise with all other Trust leads on replacement PACS/RIS programme. Assist clinical staff in identifying requirements and benefits To become the figurehead for EMRAD and point of contact for all EMRAD areas of discussion and to drive the decision making process during the deployment stage.
EMRAD Clinical Lead	Provide expertise on the clinical requirements of the new PACS/RIS solution across the East Midland EMRAD Trusts including: • Reviewing clinical requirements and specifications; • reviewing clinical risk of new system; and Ensuring that the solution will meet the needs of the EMRAD Trusts in terms of quality, functionality and ease of use To become the figurehead for EMRAD and point of contact for all EMRAD areas of discussion and to drive the decision making process during the deployment stage.
EMRAD Technical Director	Provide expertise on the requirements of the new PACS/RIS solution across the East Midland EMRAD Trusts including:: • reviewing technical requirements and specifications; • reviewing clinical risk of new system; • Reviewing testing scripts and test approach across the East Midlands EMRAD Trusts Reviewing the business workflow and ensuring that the solution will meet the needs of the EMRAD in terms of quality, functionality and ease of use To become the figurehead for EMRAD and point of contact for all EMRAD areas of discussion and to drive the decision making process during the deployment stage.

Appendix S Trust Key Roles

Role	Key Responsibilities
Senior Responsible Officer (SRO) – Board Chair	To chair the board meetings; To oversee the project and ensure that it delivers its objectives; Is available to resolve problems and can act as a decision maker if required; outside of formal meetings; Ensures that the scope of the project is followed; and Provides advice and guidance on the project as necessary
Clinical lead	Provide expertise on the clinical requirements of the new systems including: • Reviewing clinical requirements and specifications; • reviewing clinical risk of new system; and • Ensuring that the solution will meet the needs of the project in terms of quality, functionality and ease of use
ICT IT Lead	Provide expertise and advice on all areas of IT resulting from the replacement of the systems including: • reviewing technical requirements and specifications; • network requirements; • suitability of reusing existing hardware if applicable; • storage options; • data centre requirements • data migration options and • interface requirements
PACS/RIS Application and Configuration	Provide expertise on the requirements of the new systems including: • reviewing technical requirements and specifications; • reviewing clinical risk of new system; • Reviewing the business workflow and ensuring that the solution will meet the needs of the project in terms of quality, functionality and ease of use
Senior Project Manager	Provide information and guidance where necessary to trusts and /or the board. Support the Trust in identifying and mitigating risks and issues related to exit. Manage a national slot plan for the exit of trusts from the existing service. Provide technical resources to aid the trusts in their decision making process
Trust Workstreams	Identify individual trust IT requirements for the new system. Identify individual trust clinical requirements for the new system. Identify individual trust operational requirements for the new system